Nature Magazine

VOLUME 45 NUMBER 5

MAY 1952
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Birds of Northern Gardens and Shade Trees. Song Sparrow. Robin. Catbird. Baltimore Oriole. Yellow Warbler. Flicker. Chickadee. Wood Pewee. Chipping Sparrow. Red-eyed Vireo. Yellow-throated Vireo. Warbling Vireo.

Birds of Southern Woods and Gardens. Indigo Bunting. Pine-woods Sparrow. Pine Warbler. Orchard Oriole. Yellow-breasted Chat. Carolina Wren. Mockingbird. Brown Thrasher. Cardinal. Summer Tanager. Chuck-wills-widow. Barred Owl.

Birds of the Fields and Prairies. Bobolink. Meadowlark. Western Meadowlark. Vesper Sparrow. Field Sparrow. Red-winged Blackbird. Prairie Horned Lark. Savannah Sparrow. Lark Sparrow. Killdeer. Spotted Sandpiper. Burrowing Owl.

North American Game Birds. Ruffed Grouse. Bob-white. Wild Turkey. Dusky Grouse. Prairie Chicken. Chachalaca. Gambel's Quail. California Quail. White-winged Dove. Woodcock. Canada Geese. Mallard Ducks.

Birds of Western North America. Wren Tit. California Thrasher. Nuttall's Sparrow. Fox Sparrow. Western Tanager. Black-headed Grosbeak. Lazuli Bunting. Blue Grosbeak. California Shrike. California Purple Finch. Plumbeous Vireo. California Woodpecker.

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Some Familiar Birds of the Roadside. Red-eyed Towhee. White-eyed Towhee. Cowbird. Least Flycatcher. Starling. Western Meadowlark. Dickcissel. Chestnut-collared Long-spur. Clay-colored Sparrow. Willet.

Some Birds of the Lakes and Marshes. Common Loon. Whistling Swan. Lesser Canada Goose. Western Grebe. Pied-billed Grebe. Sandhill Crane. Coot. Kingfisher. Boat-tailed Grackle. Limpkin.

More Birds of the Marshes. Red-winged Blackbird. Yellow-headed Blackbird. Long-billed Marsh Wren. Short-billed Marsh Wren. Swamp Sparrow. American Bittern. Wilson's Snipe. Virginia Rail. Sora.

Some North American Warblers. Ovenbird. Kentucky Warbler. Louisiana Water-Thrush. Northern Water-Thrush. Black-throated Blue Warbler. Black-throated Green Warbler. Northern Yellowthroat. Canada Warbler. Prothonotary Warbler. Yellow-throated Warbler. Hooded Warbler. Chestnut-sided Warbler.

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COMSTOCK PUBLISHING ASSOCIATES

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Ontario Nature Camp

Again this summer, from June 28 to July 12, the Federation of Ontario Naturalists will conduct its Nature camp at Camp Billie Bear, on beautiful Bella Lake in the Muskoka district, just seventeen miles from Huntsville, Ontario. This is the fifteenth year of the school, which has proved so valuable and successful in the past fourteen years. Full information may be obtained from The Federation of Ontario Naturalists, 85 King Street, East, Toronto, Canada.

Beauty-Loving Mother

Miss Caroline E. Toner of Falls Church, Virginia, found particular joy in Charlotte Hilton Green's fine article, "To A Beauty-Loving Mother," in our March issue. She writes us that she had the rare privilege of having a beauty-loving mother, and sent us the following poem inspired by the teachings of her mother. Miss Toner entitled the poem, "Spring Flowers."

Take a walk in the woods in spring time,
Note the flowers, their eyes peeping through
As they peer all about for old neighbors
To wish them a friendly, "How do."

Their looking-glass down in the meadow
Is the tinkling, sweet-singing brook,
So pleased is it at their beauty
It lets them see just how they look.

Each year they hold a reunion,
These darlings down in the wood.
I know just when they will gather,
And my welcome is quite understood.

I wonder what secrets they whisper
Down there under the sod —
No matter, I know they were happy
Tucked in there so snugly by God.

Wren House

A fit-together wren house that can be assembled quickly and without glue, nails, or screws has been devised by W. R. Vermillion Co., 2205 Grand Avenue, Kansas City 8, Mo. It is called "Wrenhaven" and is made of seven pieces of Masonite Tempered Duolux, cut to interlock and silk-screened to resemble a house. The price is $1.50.

Doctoring Plants

The Gardener's Troubleshooter. By Victor H. Ries. New York. 1952. Sheridan House. 320 pages. $3.50.

This is a volume designed to solve garden problems and to tell the gardener what to do when his plants do not seem to be behaving as they should. The author introduces his helpful material by discussion of what might be called horticultural preventive medicine, pointing out how good gardening will forestall troubles. Thus proper soil, fertilizer, water, light, temperature, wind and climate bear upon this. Dr. Ries, who is horticulturist at Ohio State University, provides excellent material on garden pests and their control. He also provides a guide to sources of aid in solving garden problems. All in all, this is a well-rounded, practical and rather unusual type of garden book.

Nuttall's Travels

Nuttall's Travels into the Old Northwest. Edited by Jeannette E. Graustein. Waltham, Mass., The Chronica Botanica Co. New York, Stechert-Hafner, Inc. 1952. $3.00.

This is an unpublished diary of the expedition up the Missouri made in 1810 by Thomas Nuttall, the famous botanist. While his observations center around the flora and fauna, there is much material that gives a vivid picture of the frontier of the time. The editor supplies a brief account of Nuttall's life, and illustrations and data on the former botanic garden at Cambridge, Mass. This memoir is published as No. ½ of Volume 14 of Chronica Botanica.

Local Bird Book

The Birds of Hancock County, Ohio. By Richard Stuart Phillips. Findlay, Ohio. 1951. Findlay College. 63 pages. $1.50.

This little local bird book discusses 188 species of birds that have been observed in Hancock County, 84 of which species are nesting species. This county lies within the Maumee Valley. The author supplies information that will enable bird enthusiasts to know when and where to look for either bird residents or migrants.

Adventure North

Alaskan Adventure. By Jay P. Williams. Harrisburg, Pa. 1952. The Stackpole Company. 299 pages. Illustrated. $4.50.

The author of this book went to Alaska early in this century and has been there ever since, roaming the Territory from Ketchikan to the Bering Sea. Thirty years of his life in Alaska was spent with the U.S. Forest Service. Now retired, he can look back on varied pioneer adventure and a wide knowledge of the geography and wildlife up north.

Arranging Flowers

Flower Arrangements for All Occasions. By Marie Johnson Fort. New York. 1952. Rinehart and Co. Illustrated in color and black and white. 237 pages. $8.50.

This is a lovely book in which is presented an informal and practical discussion of modern flower arranging by one who is widely known as an arranger, judge and lecturer in this field. Anyone who has not ventured into this art has little idea how involved and interesting it is. One who contemplates so venturing will find this book essential, we should say. The splendid illustrations, many of which are in full color, add materially to the practical value of the volume.

Nature in Print

By HOWARD ZAHNISER

REVIEWING Joseph Wood Krutch's *The Desert Year* (which will also be discussed on this page later), Charles Poore recently suggested in his "Books of the Times" in *The New York Times* that one reason New York is so crowded these days "is that it is so full of Thoreaus, all writing eloquent books and pieces in praise of being somewhere else." Another crowd, possibly even larger, he surmises, "is made up of people who are enjoyably reading the local Thoreaus."

Still another group, how large I do not know but one that I trust is growing, is made up of those who are reading the unique Thoreau — the Henry David Thoreau of Concord, Massachusetts — and from this group will come not only "eloquent books" but an influence for good living in our own society.

Thoreau, as I have come to know him, was not concerned that there should be more individuals living in cabins in the woods, nor was he given at all to the "praise of being somewhere else." He did not want imitators. He had his own individual interests, and he knew that others had theirs. What he had to say to all who would heed him, as I understand him, is threefold: We should, in the midst of our civil community living, maintain our individual independence of conscience and life; we should take care to barter for anything only so much of our life as it is worth *to us*; and we should maintain our touch with the natural world that is unmodified by our human inventions and conventions. "In Wildness," he wrote, "is the preservation of the World."

How one should contrive to have for himself an independent, economical living in touch with Life will depend on the individual, I believe Thoreau would say, and there can thus be many, many lives lived in accordance with Thoreau's truth. It is indeed, encouraging to see so many relating their own experiences to those of Thoreau, for his apprehensions of truth (it seems to me) were sound.

It is important to recognize what is the essence of the relation to Thoreau. The point is not that Thoreau lived (for a couple of years) in a cabin in the woods at Walden Pond, but that he lived inexpensively in order to give himself an opportunity to do the writing he wished to do and that he lived in touch with the Wildness that preserves.

Vena and Bradford Angier, two former Bostonians — a journalist, and his wife, a dancing teacher — went all the way to Hudson Hope, British Columbia, to emulate Thoreau, and they write intriguingly of their experience in a volume entitled *At Home in the Woods: Living the Life of Thoreau Today*. Hal H. Harrison, in *Outdoor Adventures*, a volume addressed primarily to young people, has quite as successfully demonstrated a modern regard for the natural world that would please Thoreau, and has done so without reference to Thoreau and without going from Tarentum, Pennsylvania, much farther or much more often than Thoreau left Concord. I commend both books to your reading.

Vena and Bradford Angier had an apparently ideal happy life in their cabin on the banks of the Peace River, and their account succeeds in communicating their sense of happiness to the reader. This is true in spite of an unusual number of typographical irritations and some uneasiness at times with the manner in which the writing is contrived. Some readers may find the frequent reliance upon Thoreau as a model and seer an interference, but to others of us this adds interest. Some may think that dialog is used artificially at times when direct narrative would seem more natural. But all will feel, I believe, that here is a sincere account of a true experience, and that here is a record of real happiness.

"We went to the wilderness," say the Angiers in their first sentence, "because 100 years ago a man wrote a book." They had been "putting off going for a long time." Then Bradford Angier read from Thoreau: "What people say you can not do, you try and find you can." *At Home in the Woods* is the record of the first year of their own proof of this — their fortunes in providing themselves shelter and food from the country, their joy in the help and friendship of the other inhabitants of this frontier and the nearby community, their success with their cash crop of writings purchased in the centers of civilization where so many are eager to live such lives at ease in urban and suburban armchairs, and especially their rich companionship with each other.

"The fire crackled reassuringly, shoving back the frost," we read, for example, in one part of the book obviously written by Vena Angier. "Wind, fresh from the Arctic Circle 11 degrees farther north," she continues, "swirled around our new log home. Already the storm seemed immeasurable light years away. I silently thanked the Almighty for the commonplace things about us that suddenly meant so much.

" 'The necessaries of life are food, shelter, clothing, and fuel,' Thoreau had said. To these requirements I added the one spice that could make them savory: mutual love! Here in northern British Columbia, I knew Brad needed me as surely as I required him. The realization gave me a warm satisfaction of belonging.

" 'What is happiness?' I wondered aloud for the second time in two days.

" 'Dunno,' he responded. 'Having what you need and being contented with it, I guess.'

" 'That must be why I'm so happy now,' I decided, dropping down beside his chair. 'We do have everything we need, don't we, including each other!' "

Thus concludes one chapter in this account of the first year in the cabin. In one of the two concluding chapters of the book we are told that "the next three years were similar to it" and then the Angiers left for Boston — only to return later, as "settlers." It is a happy ending and assures us that their life on the banks of the Peace River is indeed more than an excursion.

"It was as if we'd both been away a long time, and now we were back together once more," writes Vena Angier. "Perhaps we would need the brief tense contrast of cities again, I knew," she continues. "Yet here, I realized, could be our only permanent home — where we could dwell like king and queen on an average ten dollars a week, where despite a small income we could build up such a savings account as was improbable elsewhere and where, free as air, we could stretch and breathe and really live."

We shall always need such people as the Angiers who will go to the frontier for us in our own generations and through their testimonies bring us the vicarious experience of their wilderness living. For the rest of us, however, there must also be excursions of our own to the wilderness if we are to preserve our way of life and our culture — just as the Angiers will "need the brief tense contrast of cities." Thus our civilization needs for our excursions the preservation of wilderness areas within itself but also the expanse of wilderness on its edge, for the Angiers of the future as well as the present.

"There's a fortune in this wilderness if they ever get a railroad," Vena Angier remarked on one of their excursions when she saw veins of coal, but Brad replied: "Maybe there's enough fortunes in the world and not enough wilderness."

But the vicarious experiences of books and vacation excursions are by no means enough for our health and welfare — nor are the wilderness excursions practicable for all of us even once a year. Hal H. Harrison's *Outdoor Adventures*, however, gives an insight into possibilities that can be realized by nearly all of us as frequently as weekends. And it gives us guidance to a way of living

Friendly Willows

By MAY ALLREAD BAKER

Down beside the grassy meadows
Where the sleepy waters drowse
And small, country streams meander,
Willows dip their pendant boughs.
Standing ankle-deep in mosses,
Leaning cloud-like, o'er the brink,
Willows lend their shade and beauty
Where the cattle come to drink.

with an ever-present interest in our natural world.

Through the experiences of his two children, whom he calls Billy and Jane, Mr. Harrison brings us some fifty-one one-page accounts with such titles as "Salamander Hunting," "Learning about Snakes," "The Family of Ferns," "The Truth about Bats," and "Rabbit Tracks in the Snow." Opposite each one-page account are two (or occasionally three) of Mr. Harrison's vivid photographs — at the top of the page a photograph of Billy and Jane (with usually their English setter) enjoying the subject of the account and at the bottom of the page a beautiful and revealing close-up (or two) of this subject. Gathering the separate accounts into a unity are four introductory essays on the seasons (by which the accounts are arranged) and an eloquent preface in which Mr. Harrison gives a deep meaning to his experience and his book.

"If there is anything that sets Billy and Jane apart from the average child," he writes in his preface, "it is this: They have learned a deep appreciation for the wild things with which they must live. They are interested in the lives of birds and insects and flowers and frogs. They love to go to the country, for they find so much to interest them there.

"This already has had its influence on their lives. They have acquired some humility because their horizons are distant, not close. They realize to some extent their own littleness in the great scheme of things. From this, tolerance has been born.

"And finally, like all who come a little closer to Nature, they are very conscious of the presence of that Great Spirit in the smooth operation of this earth and its creatures. They know there just HAS to be some Guiding Light."

At Home in the Woods: Living the Life of Thoreau Today. By Vena and Bradford Angier. New York: Sheridan House, 1951. 255 pp. (5¾ by 8⅝ in.), with 18 photographs on 16 plates. $3.50.

Outdoor Adventures. By Hal H. Harrison. New York: The Vanguard Press, Inc. 1951. 128 pp. (6¾ by 9⅞ in.), with 113 photographs on 62 of these pages, and index. $2.75.

For the Dove

From Guy Atherton, Director of Conservation Militant, Box 72, St. Paul 2, Minnesota, comes a very important newssheet report on the mourning dove situation. Mr. Atherton has just completed a survey of the position in which the dove finds itself and presents these data in effective and valuable form. For three one-cent stamps he will send this to anyone interested, and can supply copies to anyone wishing to make personal distribution. these for a two-cent stamp per copy. We shall have more to say about this material editorially in a coming discussion of the mourning dove.

The Stars

The Stars. By H. A. Rey. Boston. 1952. Houghton Mifflin and Co. 144 pages. Illustrated with end maps of the skies. $4.00.

The author has directed this book to those who want to "know just enough about the stars to be able to go out at night and find the major constellations, for the mere pleasure of it." He feels that most of the astronomy books designed as introductions to the heavens fail in the way they represent the constellations. So Mr. Rey sets out to show the constellations in a manner that suggests the shape indicated by the name of the constellation. He discards the allegorical representations and the geometrical figures in favor of the graphic approach. He succeeds admirably in this approach. The dust jacket, feeling particularly heavy to the hand, turns out to be, when unfolded, a wall-size chart of the heavens. Extra copies of this are available from the publishers at one dollar each.

Albatross

Wandering Albatross. By L. Harrison Matthews. New York. 1952. The Macmillan Company. 134 pages. Illustrated. $3.00.

This is a book of adventure among the albatrosses and the petrels of the southern ocean. The author spent three years in the icy, wind-swept bird paradise of South Georgia. The book is not only about the birds but about life when sailing in an old windjammer in this part of the world.

New Science Series

Planet Earth. By Rose Wyler; *The City.* By Rod and Lisa Peattie; *Water for People.* By Sarah R. Riedman. New York. 1952. Henry Schuman, Inc. Illustrated. $2.50 each.

These are the first three titles in a new science series entitled "Man and His World." They are aimed at the younger audience from ages ten to fourteen and designed to answer questions that the active-minded youngster may reasonably be expected to ask. *Planet Earth* describes the earth, inside and out, and its place in the universe, and what man has done and is doing to its resources. *The City* considers the growth of cities from early days to the present, and the impact of the city upon man. *Water for People* deals with a vitally important subject and how man has used and, often, abused his resource of water.

Fishing Baits

Natural Fresh Water Fishing Baits. By Vlad Evanoff. New York. 1952. A. S. Barnes and Company. 98 pages. Illustrated. $1.50.

This is a practical book for the fresh water fisherman, telling him what are the natural baits and giving him information on where these are most likely to be found. Baits that can be propagated are also described.

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IN THIS ISSUE

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A BLUEJAY FINDS HIS CACHE

By ALICE E. ALDRICH

I HAD often seen bluejays in the fall of the year place some treasure of theirs in the grass, cover it with two or three of the fallen leaves that lay so thick about, and then fly away. Evidently they hid something too hard to crack until continuous moisture had softened it.

Only once, however, have I seen a bluejay find his cache. It was in early December. About two inches of snow had fallen, and it was still snowing. I was looking out the window when I noticed a bluejay perched on the low, horizontal branch of a spruce tree that stood some ten or twelve feet from the house. Presently he began to move nervously, sometimes facing one way, then turning about to face the other, all the time his head in quick motion, his eyes gazing downward. He was evidently getting a line on his cache. Suddenly he dropped to the ground. With beak and claws he began his excavation, the displaced snow lying in a broken circle around the edge of the little pit he had made. It was only a moment, however, before he stopped digging and flew up to his perch again. Apparently he had not found the right place.

Again he moved about nervously on his branch, his eyes searching the ground. Then he flew down once more to begin operations only a few inches from the scene of his first attempt. Beak and claws again made the snow fly until he had made a sizeable hole, around the edge of which the displaced snow lay in a circular mound. Presently scraps of black, dead leaves appeared in a circle on top of that displaced snow. One final, forceful dive with his beak, and he flew up to his perch again, his beak spread apart by something he held in it. What it was I could not see. It was something very real, however, and evidently still a bit hard, for while he held it under one claw he rained vicious blows upon it with his beak. I watched him until he had eaten all his treasure. Then he flew away.

Drawing Birds

How I Draw Birds. By Roland Green. New York. 1952. The Macmillan Company. 96 pages. Illustrated. $3.00.

Roland Green is an eminent bird artist in Britain and, of course, an enthusiastic student of birds. Probably few of us can bring the birds to life with pen, pencil and brush, but in this book one can at least envy the author's ability to do so, and perhaps try some sketches, thanks to his inspiration.

More Fishermen

More fishing licenses were sold in the United States in the fiscal year ending last June 30 than in any other previous year. Compilations reveal a total of 16,026,699, which produced a gross revenue of $35,554,285.

EXTENDING CONSERVATION EDUCATION THROUGH TEACHER TRAINING

By Theodore E. Eckert

DURING the past three years in New York State we have been making serious efforts to improve both pre-service and in-service phases of teacher training in conservation in the eleven teachers colleges.

From May 1949 through June 1951 five conference sessions designed to improve *pre-service* training were held at the New York State Conservation Department Camp at DeBruce, New York. Behind the effort were the State Conservation Department, the State Education Department and the State University of New York. One of the most important outcomes of the conferences was the agreement that the teachers colleges would offer workshops in conservation education on their campuses. The June 1951 DeBruce Conference was a training session for the teachers college and campus school personnel who would run these summer workshops. Five days of preliminary training were provided under the direction of the State Conservation Department. The instruction dealt with the fundamental principles and problems of conservation of resources and presented teaching materials and techniques suited to campus and school ground use.

During the ensuing summer, six of the state teachers colleges presented workshops. These were Buffalo, Cortland, Geneseo, New Paltz, Oneonta, and Oswego. Most of the other teachers colleges offered summer session courses in conservation of resources. Consequently, training in conservation education was more accessible to teachers in New York State during the summer of 1951 than ever before.

Meantime other efforts to extend conservation education through *in-service* programs were going on. Training sessions for which outstanding teachers are selected on a state-wide basis and trained for potential leadership in local or regional situations are essential in promoting a State program. During the summers of 1949, 1950, and 1951 training sessions of two days duration were held; the first on the Cornell campus, but the other sessions were moved to the Arnot Forest Tract, near Ithaca, New York.

Through these three sessions more than one-hundred and fifty school people from forty-five counties in New York State have been given basic conservation education experiences. Represented among these groups of educators were elementary teachers and supervisors, curriculum coordinators, school principals, teachers college personnel, representatives of the State Education Department, and secondary school teachers of science, of social studies, and of vocational agriculture. Those who attended were selected from candidates recommended by school principals and superintendents, as being in a position profitably to share with others what they gained and to act as leaders in their own schools and in regional groups.

Instructional experiences at these sessions have been directed by experts in conservation and in educational methods. The experiences have included field instruction, demonstrations, supervised learning activities, recreational activities dependent upon natural resources, safety demonstrations, and informal campfire discussions and entertainment. Instruction has been kept at a level that would permit application throughout New York State. The teaching techniques and demonstrations offered were suitable for use by any teacher on almost any school ground area.

Bringing help and training to teachers through short, *local* training sessions on their own grounds has been an important part of our effort at Cornell University. The first two sessions were conducted during October and November, 1949. Since that time about ten other short training sessions have been offered. Some have been little more than an evening demonstration lecture. Others have involved an evening session and a full day of outdoor instructional activities.

In our local training sessions, personnel nearly always has included both conservationists and educators. Local conservationists are drawn in whenever possible. Our greatest effort is devoted to actually showing teachers in their own classrooms, or on their own school grounds, the opportunities that exist, under their very noses, so to speak, for teaching conservation effectively.

We show the teachers that any number of little situations exist on school grounds and about school buildings where, for example, soil erosion, wind and water action, and where food, cover, and other habitat factors influencing wildlife may be studied and related to conservation problems, principles and practices. I have yet to see the school where slope, area, and cover in relation to watershed problems, or where some aspect of most other conservation problems cannot effectively be studied.

We have gradually assembled a variety of demonstrations useful in the classroom and in the schoolyard. The equipment used is the simplest we can devise, and it consists mostly of the kind of "junk" that can be readily obtained almost anywhere. Scarcely anything is used that is more complicated or difficult to obtain than tin cans, discarded scraps of lumber, glass jars, cake pans, laundry sprinklers, yardsticks, mouse traps, and thermometers and levels from the ten-cent store. The simplicity of the equipment and the commonplace nature of the little situations we use, do more than anything else, I think, to convince teachers that they can do something interesting to active youngsters about teaching conservation. And when you have won this initial victory, you are, with many teachers, well on the road to progress.

We have found it advisable to close our training sessions with a general discussion and question period. We invite the teachers to put us on the spot with all the questions and problems that are bothering them. These questions generally follow a pretty uniform pattern, too. But a vigorous and profitable exchange of ideas usually results and enables teachers to get over many of the initial hurdles of getting organized for action. Frequently, a committee is appointed to plan the next steps in setting up a conservation teaching program for the group. By the close of this session the teachers are well aware of their need for further conservation information, know that there are persons in or near their community who can help them get this information, have been assured that they can call upon us at Cornell for further assistance and suggestions, and feel that they can go ahead with reasonable chances of success.

I can assure you that we realize and that we stress that a training session of the type just described represents the merest beginning of the task of developing an adequate program of conservation teaching in a school. In a few cases we have been called back to the same school group several times as they progressed with their program. We consider these follow-up opportunities our best evidence of a successful initial training session, as well as a good indication that a school program may be developing.

We make every effort to avoid telling the groups definitely what they should do and to avoid pushing them too rapidly into an effort for which they are not ready, but we stress continuously the need for planning an effort that will be sustained over a period of years and for writing their own program, suited to the needs of their own school and community. We are most concerned that these local groups develop competence in dealing with their own conservation curriculum problems and that they select and make full use of their own leaders and resource people.

St. Francis Day

From E. Clifford Pratt, 17 Chilton Road, Toronto 6, Ontario, Canada, comes a reminder that St. Francis Day for Animals will be observed this year on October 4. It has been so designated by the World League for the Protection of Animals in England. Mr. Pratt will be happy to send information on this observance to interested individuals and organizations.

Contents Noted

THIS month we are going to devote this page to somewhat random, often, perhaps, inconsequential comments on the recent Seventeenth North America Wildlife Conference in Miami, Florida, and on Florida. Although we have traveled widely southwest, west, northwest, northeast and east, we had never visited Florida before. This first introduction invites vastly more exploration, in which we assuredly intend to indulge ourselves as opportunity offers. On page 257 we have presented editorial comment on the Conference, and a necessarily brief discussion of some of its significance as we see it.

PROPER tribute should be paid to the Wildlife Management Institute for planning, convening and paying the expenses of this annual session. It is a task that is full of headaches and is expertly done under the direction of the Institute's vice-president, C. R. Gutermuth, who, for some inscrutable reason, bears the nickname of "Pink." Not only does the Conference provide a meeting place for all conservationists, but, and specially, it brings together the younger men working in technical fields of wildlife research and management. They are the ones who are gradually taking over leadership. The encouragement and opportunity thus offered them is of inestimable value.

THE March meeting this year was the first to be held in Florida, and the sample of March weather offered was all that any chamber of commerce could ask. Personally we moved, in three short hours from an even thirty-two degrees to the mid-eighties, and did we love it! Most of us found residence in hotels along Biscayne Boulevard, and not far from the municipal auditorium where we met, acquiring sunburn as evidence of our visit as we ambled hatless back and forth to and from sessions. Despite the charm of outdoor Miami, and nearby and fantastic Miami Beach, absenteeism from the meetings was amazingly low. There were those, of course, who could linger on a day or two to enjoy fishing and sightseeing.

FOR us this trip provided the opportunity to be with our Microscope Editor, Julian Corrington, who is Professor of Biology at the University of Miami. With him, and talented Mrs. C., we toured the immediate vicinity, and saw the fascinating and growing university and its campus. We were introduced to the fine "Monkey Jungle," with one of the outstanding collections of monkeys in the world. It was the first time we have been inside the cage with the monkeys outside.

WE HAVE always had a distaste and a distrust of roadside zoos and other similar attractions, obviously or tacitly designed to lure the tourist. Many of these are downright inhumane and should be abolished, or are definite gyps. Not so most of the attractions not far from Miami. They are not catchpenny affairs but seem to be run by people who realize that word-of-mouth advertising by pleased visitors is better than any other promotion. Such exhibits as the "Monkey Jungle," "Parrot Jungle," "Rare Bird Farm," "Orchid Jungle" and "Serpentarium" are all very much worth visiting. We will confess that we were agreeably surprised, and we commend all these to visitors to the Miami area.

ONE treat that we enjoyed was a day in Everglades National Park, in the company of Newton Drury, former Director of the National Park Service, and Mrs. Drury; Ronnie Lee, Associate Director; Vic Cahalane, Chief Biologist, and genial and able Dan Beard, Park Superintendent, and members of his staff. We were thus able to get a picture of the possibilities and the problems of the Park. The former are limitless and the latter not few. We doubt that this Park will ever be an attraction for the tourist who just wants to see something and not learn something in the process. The fascination of the Everglades lies in its significance as a subtropical wilderness and habitat for a varied and interesting wildlife, and for its distinctive flora. Interpretation to the average visitor will be in proportion to adequate funds available for its development, and these are still limited. What Dan Beard and his staff have done thus far is quite remarkable.

ONE of the high points of the Conference sessions, to us, came when Olaus Murie received the annual award of the Wildlife Society for outstanding contribution to conservation. Among the most modest and gentle of people, and yet one of the most steadfast conservationists, O.J. had no idea that this honor was coming his way. We were sitting next to Olaus at the head table and know how touched he was. No one could have deserved the honor more.

JUST to prove that these items are both random and inconsequential, we indulge ourselves in the following observations: Stone crabs at Joe's in Miami Beach — interesting but we will have to cultivate a taste. . . Florida lobster — really a crayfish — is tasty, but as a former New Englander we will stick to the real lobster from Maine. . .An airboat ride on Florida Bay, with its two-foot depth and its wealth of bird life, is a real experience. . .We added a new sport to our experience — Jai Alai — and it is terrific. . .When one of Dan Beard's rangers proved himself a super pistol shot by plugging a fifty-cent piece in mid-air several would-be poachers decided to leave Everglades National Park alone. . .Let it be understood that we are under no obligation to any Florida promoter, but we could hope to find a spot to retire there one of these days. Of course, we might miss never seeing even a little hill. Who knows? R.W.W.

This young wild wood duck is quite at home ashore. As a downy duckling he may have walked a mile to water from the tree-hole nest selected by his parents; like them he prefers the smaller ponds and marshes and wood-encircled sloughs. In maturity he is famous as the handsomest and most colorful of all North American ducks.

Wings of the Marsh

By JOHN LINDSAY BLACKFORD

Illustrated with photographs by the Author

★

Black tern in flight.

COPPERY dawn burned in the sky. An up-swinging sun shot level rays from beyond the waving tule screen. On the glimmering waters of the vast marsh, waterfowl rose buoyantly, stretching wide pinions, burnishing their underwings with the first light. Then, in the brassy glow, from the low horizon came a swift line of aeronauts—white-faced glossy ibis winging over the green, interminable marshlands where sluggish Bear River finds Great Salt Lake. Strikingly silhouetted, the "black curlew" spanned the bright segment of eastern sky and passed swiftly, the level light iridescent on bronzy plumage. One great bird broke from the line and flew with powerful, cleaving strokes, flanking the long file.

It was but a single alluring moment among many experienced in western marshes; yet it reminded me forcefully of the almost exotic company of birds that inhabit our secretive reedlands.

The mazes of cattail, tule, cane and sedge boast a list of birds matched by few other environments. No other habitat more definitely marks its own. And the amazing adaptations to life here are a never-ending source of wonder and speculation to naturalist and outdoorsman.

Here a young Merrill song sparrow has left his nest in swamp-bordering willows for a safer nursery in the verdant tangles of tall, lush cattail blades. Along the watery borders of the bog his parents glean his dinner from the teeming insects of the marsh.

It is at once apparent that the marsh imposes definite limitations upon the life-stream flowing within it. Universally there is but a single layer of cover, low and dense, although the water itself, together with its zone of floating plants, may be considered another, taken advantage of by the diving birds. Marshlands are relatively restricted. Only on protected, low-lying, mud-bottomed shores, on deltas, in coves and estuaries, about lakes and ponds, and beside river ranches at grade level, do suitable meetings of land and water occur. Weather-shelter often approaches the minimum. Nesting is at the mercy of changing surface levels and weather extremes. In northern regions all normal activity must wait until new, green jungles of cattail and bulrush spring from the sear and fallen ranks of the old. Winter swings a frosty scythe across the marshes, mowing down once verdant and impenetrable tangles, and locking the channels and ponds. As a result most bogland birds are highly migratory. Ice, reduction of cover, and dormancy of other life combine with the cold to force desertion.

Of the feathered swamp folk who follow this seasonal rhythm, many adaptations are required. Muddy banks have

Montana's Island Lake, home of bittern, loon, grebe and marsh hawk, still holds much of the wilderness peace and allure that we are forever seeking. Its warm, root-stained, weed-grown, algae-brown waters give abundant life to the lush green necklace of marsh and floating sedge-mat that curves around its boggy shore. Note beaver lodge beside the cattail wall.

lengthened the sprawling toes of the gallinules; oozy edges lobe the feet of the coot. So many generations of rails have slipped unseen through reed-choked runways that we speak of the slender-bodied: "thin as a rail." Long legs carry deep-water waders clear of the scummy flood; lengthy necks reach spear-like bills to the bottom, or raise far-sighted eyes of crane and heron above the head-high cover.

To live here grebes have learned to submerge without a ripple. They build floating raft-nests of decaying vegetation that help to incubate their eggs, and dispense with cradles, their young taking to the algae-green water almost at once. Diving ducks have their own peculiar foot adaptation — a paddle-like hind toe. The exposed earth is soft, so probers of the miry margin have developed long bills tipped with delicate nerve ends that signal to their owners the squirming of unseen worms in the mud. In this multiple habitat

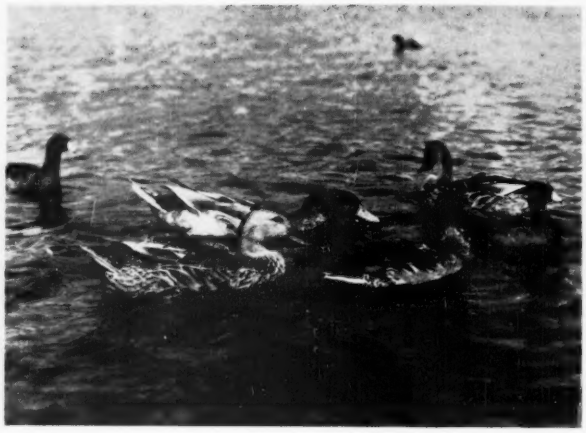
Screaming and crying black terns wing low over an intruder along the marshland coast. Their protests may be well understood if the partly upturned flaps of some of the larger lily pads are lifted — a number of them conceal cunning, cuddly black tern chicks! This dove-gray tern fledgling will soon be a-wing, leaving the depths of yellow pond lily-cattail marsh for the free universe of the air above it; but terns never forget their love for the lake's marshy margins.

These precocious ducklings of the ring-necked duck will grow up along the protecting border of their lake's pond lily-cattail-tule fringe. Already they are expert divers, and later will be numbered among the fastest flyers of their kind. But they will continue to love the marshy shoreline rather than the open waters of the wide lake.

of cane brake, water, and underwater, countless winged dwellers have modified flight, enlarging upon or atrophying it. The protectively patterned, tan-striped breasts of clever bitterns are seen to sway with the waving cattail blades; but doughty redwings throw camouflage aside and blaze crimson epaulets from every bending stalk in their chosen environment.

Here at the watery borders of the bog there are many avenues of escape. By swimming, by diving, by flight, or by vanishing into green tangles of the reeds, a marsh dweller may readily elude most enemies. And there are many of them, for abundance of food at-

The bright vermillion flash of the jaunty red-wing's colorful shoulder patches, contrasting with shiny jet of sleek black suit as he sways from some bending cattail stalk, together with the jolly o-ka-leeee of his reedy notes, are as inseparable from the marsh as the meadow from the meadowlark's song.



As characteristic of the marsh as cattails and tules themselves are the mallards and coots, or mudhens.

tracts a large population, whose members in time become highly specialized and dependent upon their own peculiar environment.

The restricted areas suitable for the growth of marshland account, too, for crowding within its boundaries, competition for survival, and constant striving for successful adaptation, both in bodily form and in life-habit. Colonial nesting and social flocking are much in evidence. Innovations in nesting, such as those of that feathered submersible, the grebe, or the decoy nest-building of the tule wren, can be traced to forced change in physical form and to survival-effort amid crowding and predation.

The intriguing variety of this wildland habitat is everywhere reflected in the appearance and lives of its myriad denizens. Possessing many avenues of escape, and being marvelously specialized to utilize them, the adult males of some species are quite free to indulge in bright plumage. On the other hand, if they have chosen the depths of the tangles, they likely have grown secretive; and weeks of prying about amidst their surroundings seldom disclose them to you. Seemingly, some are almost flightless, yet they migrate over vast distances. Others are so keen-sighted, marking you over the immense open afforded by the marsh's low cover, that you will usually fail of near approach. Again, the voices and calls of several bog dwellers are loud and raucous — manifesting the safety their kinds experience here, and their freedom from pursuit by numerous furred and winged predators, hunters that cannot penetrate these watery reaches

Here is given but a glimpse into adventure. Those green and reedy aisles, those curious and striking adaptations of its inhabitants, make the marsh perhaps the strangest, most fascinating domain of the outdoors.

Thoughts from the Backwoods

By OSCAR OSTLUND

MY SOJOURN in the mountains coincides with the years in which the convictions of many, including the learned, fell by the wayside. I had, in the beginning, no clear ideas about life, but living close to Nature served to open a door, to stimulate a receptivity in this direction. A definitive viewpoint evolved, and this, in the ultimate, harmonized with the "supernatural," which, by itself, theologically presented and out of context with Nature, had been hitherto unacceptable.

* * *

The existence of magnetic lines in thought seems to be as much in evidence as the existence of magnetic lines in the physical makeup of the universe. Have not original thinkers — unknown to each other and remote from each other in time and space — seen the same thing; the same perennial, unifying principle? Ideas converge, like streams of water in their natural flow, although the authors of these ideas have been separated by centuries and subject to different stimuli in their cultural environment. The literature of the intuitives reveals that Chinaman, Nordic, Hindu, Frenchman, Greek and Jew have responded to the same identical impulse in their contemplation. The record reveals that they have been thinking together in a unity of thought.

* * *

These approaches to reality — the general truths of religion, poetry and science — are like three compasses that differ visibly in appearance and structure. And though they be variously located, each one of them geographically remote from the other, the needles of the separate instruments point in the same direction.

* * *

Nature to me has been a place of contact with the deep, deep idea that underlies our existence and is the springwell of a loving attitude toward life in all its forms.

* * *

I have known three or four squeaks from a winter wren in the brush to touch my sensibility of life more deeply than any of the celebrated voices that were featured in the broadcasts on that same day.

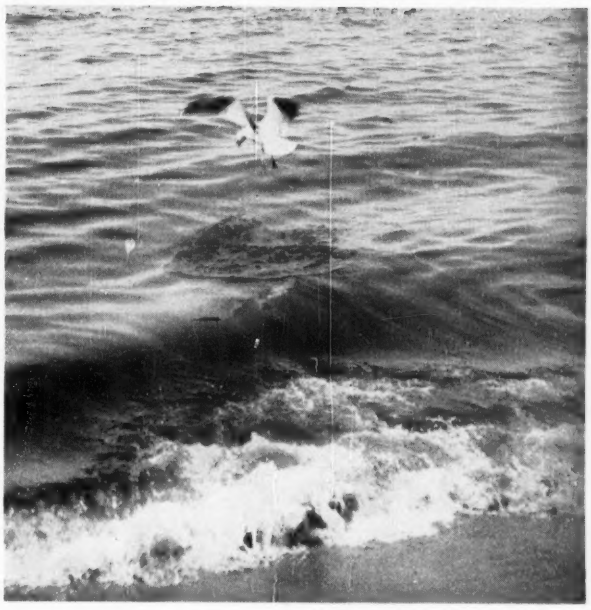
* * *

Is it possible to exaggerate the magic of the bird's song? How it lifts your thoughts into that peculiar light where everything fades out but perfection. Where you see that nothing, in the last analysis, can be subtracted from beauty; from consciousness or from life.

Place of the Golden-Breasted Woodpecker

By VIRGINIA S. EIFERT

Photographs by the Author



"Today that bright past is visible in the timeless sound of Lake Superior's waves on a stony shore, or sweeping in with a long wash on the sands of Big Sand Bay.

THE MOUNTAINS sank, and the basin that lay there, rimmed with purple lava that squeezed upward and grew hard, one day was filled with water. . . clear, cold, pale blue water. And when white men discovered it, they called it Lake Superior. But for a long, long time the greatest freshwater lake in the world was known only to the Indians, who fished and hunted along its shores.

In this always mysterious, vast body of pale blue water, the mirages every sunny day writhed and twisted and caused such contortions of the horizon and the distant shore that men grew afraid and called it magic. And there was, in this great lake, so the Ojibway said, an island made of copper. A copper island, the Ojibway said, floating in the pale water and guarded by spirits, the Che-bi-ug, who devoured all who landed there. The Lake Superior country was copper country, and the bright orange metal with its blue-green oxidation was not used in any utilitarian way by the Ojibway, but always in a sacred way. Copper was holy, related to the mystic tribal rites of the Med-a-we-win. And so when Frenchmen from across the distant ocean came to the Lake Superior country, following rumors of copper, the Ojibway at first would not tell them where the copper mines were; copper was not for profit, not for exploitation, not for men to fight over, not to be taken away from its native shores. Copper was sacred. The Indians had mined it in little pits and trenches, from Copper Harbor to Ontonagon and Isle Royale; at last one of their number gave away the secret. It was to the eager ear of Jacques Cartier, up along the St. Lawrence in 1536, that Indians told of the hills of native copper far to the west. The Jesuit, Father Claude Allouez, in 1666, was the first white man to see this metal of the Lake Superior country. And he built a mission on the Island of Copper in Lake Superior, but found at last that the story was only a myth, and the island was not made of copper after all, but of the purple rock and vermilion clay and brown sand of Lake Superior's shores, with a little copper hidden in the rock.

But men had found Lake Superior. They were inexpressibly lured to it, over and over again — to its violent white winters and to its ineffable blue summers; to the icy waters which numb the body even in August; to the floating white gulls and the yodeling loons; to the ruddy rocks, which are part of the oldest igneous formation in America, the Canadian shield. There always was something about Lake Superior that brought men to it, made them suffer in their inexperience with the uncompromising sternness of the elements. And they seemed drawn, people after people, generation after generation, century after century, to the little island off the Wisconsin shore. For on Madeline Island, the isle of copper, in the Apostle group, there was the earliest settlement of white men in the Lake Superior country, and white men have dwelt there continuously ever since. The Ojibway before them, for many years, had made it their tribal headquarters.

After the long odyssey of their migration from the east, haunted all along the way by hostile tribes, and unable to go back even if they had wished, they made the little island in the lake their haven and home. And for a long time their town stretched across the western end of Madeline Island, three miles long and two miles

wide, and they hunted deer and bear in the forest and fished for trout and herring in the pale blue lake.

The island to the Ojibway was Mon-in-wun-akauning, Place of the Golden-Breasted Woodpecker, no doubt in reference to the flicker, and here, preceding the coming of white men, the Indians lived. Their historian, William Whipple Warren, who was descended from the Ojibway and lived on the island, said:

"While hemmed in on this island by their enemies, the Ojibway lived mainly by fishing. They also practiced the arts of agriculture to an extent not since known amongst them . . . they manufactured their nets of the inner bark of the bass and cedar trees, and from the fibres of the nettle. They made thin knives from the rib bones of the moose and buffalo . . . from the thighbone of a muskrat they ground their awl. In those days their shirts and leggings were made of finely dressed deer and elk skins sewed together with the sinews of these animals. They made their wigwam covering of birch bark and rushes; their canoes of birch bark and thin strips of cedar wood, sewed together with the small roots of the pine tree, and gummed with the pitch of the pine, balsam, or tamarac. They made kettles of clay and pulverized stone. Copper, although abounding on the lake shore, was never used for common purposes; considering it sacred, they used it only for medicinal rites, and for ornament on the occasion of the grand Med-a-we-win ceremony. During this era in their history, some of their old men affirm that there was maintained in their central town on the Island a continual fire as a symbol of their nationality. For the space of three generations, about one hundred and twenty years, the Ojibway remained congregated on the island of La Pointe (Madeline) in one extensive town."

White-flowered salmon berries bloom in fragrant masses along the island's main road, which travels its eleven-mile length and back again.

And then, said the old men, there came the mysterious and terrible Che-bi-ug. No one was safe to go into the forest to hunt or along the shores of Amnicon Point and Chebomnicon Bay, to fish, lest the Che-bi-ug reach out and capture him. No one knew what the Che-bi-ug were, but it was known that men were eaten by a mysterious enemy, and in consuming terror the Ojibway went away from the haunted island. They fled to the mainland and continued their existence there, perhaps looking with longing and homesick eyes out to the low green island on the blue lake, and wondered if the Che-bi-ug still lay in wait for them. In the cold light of anthropology, we know that the Ojibway, perhaps driven to excesses by their confinement on the island, went through a period of cannibalism. But this was more decently explained by blaming it on the Che-bi-ug. No matter what it was, for more than a hundred years none of the Ojibway would set foot on the island nor stay there over night.

The enthusiastic young Frenchmen, Radisson and Des Groseilliers, built a cabin on the deserted island in 1659. Father Allouez came there to build his mission a few years later. La Ronde came prospecting for copper and built a fort on the island. When this fort fell down after a murder within its walls and the departure of La Ronde, it quickly disintegrated in the manner of man-made buildings in the Lake Superior country. Other forts were built, there in the great clearing at the southwest end of the island, where the Indian town had been; there where the white pines were growing and the waves forever gnawed at and changed the contours of the red clay shores.

From the hills of the mainland the Ojibway watched the lights of white-men's homes on the island; saw the boats of fur traders going and coming; saw the black-garbed priests starting out to visit the remote posts and Indian villages; saw La Ronde's ship, the first on the lake, come to haul his copper ore to Detroit; saw horses and machinery brought to the island, and saw them go away again when La Ronde gave up and went away.

And they saw the jovial French-Canadian, Michel Cadotte, come to the island and build a new fort and fur-trading post in 1790.

Still no Indian would stop on the island. The Che-bi-ug might still be there. But Monsieur Cadotte built his sturdy trading post on the place where the Indians once had had their town and their corn fields, there

where youthful white pines were growing near the ancient stumps of the old ones La Ronde had cut. The Indians liked this Cadotte. To the Frenchman's easy way of getting along with the Indians, he added a natural exuberance and confidence, with the result that he persuaded the reluctant Ojibway to go back to the island. And he married Madeline, daughter of Chief White Crane, and named the island in her honor. At first the Indians came only to trade at the post; later they came back as families and once more the Ojibway lived on their ancestral island.

They continued to use Madeline Island as their tribal headquarters until the treaty of 1854, grimly signed by Chief Buffalo, moved the Ojibway to the reservations on the mainland. But there still are Indians on the island, and their children attend the school with the descendents of Michel Cadotte and other

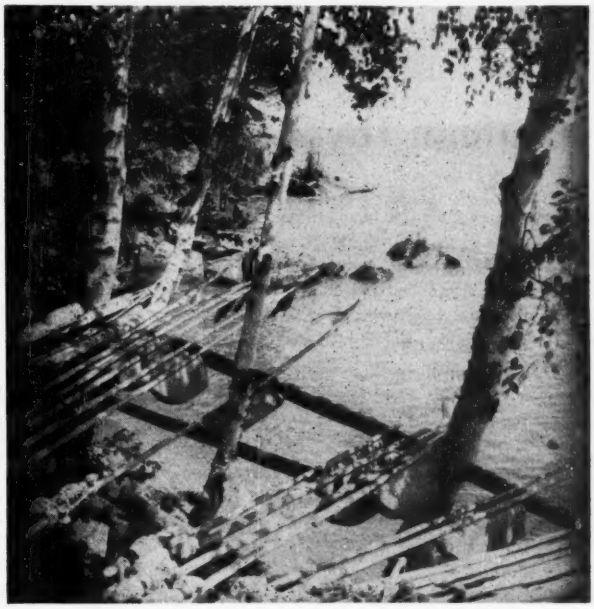
The grave of the jovial French-Canadian Michel Cadotte, who came to the island and built a new fort and trading post in 1790.

French-Canadian fur-traders and voyageurs.

The once prosperous fur-trading town on Madeline Island has disintegrated into a past that swallowed up the beaver and his precious fur in the history of America. The old missions have fallen down and porcupines have gnawed the logs. The Protestant church, which was built of logs and lined with matched sheets of birch-bark, fell down in 1937 and was never rebuilt. But the old cemeteries — Indian, French, and Protestant — tell vividly the story of the past in this Place of the Golden-Breasted Woodpecker, Madeline Island.

Today that bright past is visible in the timeless sound of Lake Superior's waves on a stony shore, or sweeping in with a long wash on the sands of Big Sand Bay. It is there in the forest, a renewed forest that replaces the old one, which burned dreadfully for a month in 1910. It is visible in the worn and weathered fish shacks and trout nets, in the white gulls perching on the fish houses, waiting for the return of the trout boats; visible in the tossed-up debris on the the lake shore, in the ancient white pines which grow where once there was an Indian town and many French forts and trading posts. It is visible in a shovel-full of sandy earth turned over in that much lived-on stretch of land at the west end of the island — a shovel-full that may reveal old charcoal from an ancient fire; crumbling fish bones; cracked deer bones and part of a deer's jaw; some tiny glass beads; bits of early 19th century china; a bent old, hand-made, square iron nail; flint chips; a bit of old mortar where a fort once stood.

But the past cannot wholly dominate a place. It lives always in the present, lives in its plants, its birds, its insects, its mammals, its todays, its sunshine and



Net poles rest on the framework built among the birches along the shore of Madeline Island.

clouds and wind and rain; in the clear, cold, blue lake waves, and the mirages slowly and endlessly contorting the distant horizon.

Now the huge, lean ore freighters, moving all day long across the great lake, coming in from Pittsburgh to Ashland or Duluth and going back again loaded with iron ore from the Mesabi and the Gogebic iron ranges back in the hills, are transformed into unreal, Dante-esque creations as the mirages affect their appearance. Just as the old lake adventurers marvelled at what they saw then, these mirages seem to cause the ships to split, to rise, to invert, to disappear, to sail on top of the Porcupine Mountains on the blue Michigan shore, to materialize again as long, lean ore freighters rounding the tricky point of Long Island Light to enter Chequamegon Bay.

The island's present is the long cold winter when lake traffic ceases and the island people live within themselves. It is the break-up in May when the first boats come through; when the gnarled old apple trees and lilac bushes on the island forget the rigorous winter and burst into splendid bloom; when white salmonberries blossom in fragrant masses along the island's main road, which travels its eleven-mile length and back again. There is the time of wild strawberries, the time when bobolinks sing along the fences behind which sleek Guernseys graze, the time of daisies, and the singing of both eastern and western meadowlarks in the same fields. It is the coming of the summer people on the little ferry from Bayfield; a raven in the road and a herd of deer standing motionless in the light-and-shade of aspens, American mergansers flying, long and streamlined, past Amnicon Point, and always the loons sitting out on the lake, or diving and coming up to call with a high and throaty wild halloo.

Also it is the *Habenaria* orchids and big blue violets along the forest road, and the singing of warblers in the trees. Meticulously, on a summer's day, there are the right warblers in the right places — a black-throated green in the hemlocks, a Blackburnian in the birches, a parula in the white cedars hung with *Usnea* lichen, a yellowthroat in the salmonberries, an ovenbird chortling in the woods, and a magnolia warbler lisping among the balsams, the chestnut-sided and the mourning in the slash. There are hermit thrushes and veeries singing their musical soliloquies at sundown, the piping of white-throats and a purple finch singing a frosty song at dawn, and a great blue heron stalking along the slapping lake water when sunlight comes in a dazzle from the east.

This is Madeline Island, the Island Made of Copper, the "Place of the Golden-Breasted Woodpecker," the Island of the Che-bi-ug, Michel Cadotte's Island, the Mission of Chequamegon Bay, the American Fur Company's island. This is the same long green mountaintop that stood up with nineteen others when cold blue water filled a great basin left when a mountain range sank, an eon or two ago.

★

Lepidopterist

By RAY ROMINE

How price the yellow daffodil
Or feeding bird upon my sill?
How judge the real or seeming worth
Of graying stone and greening earth?

What value, if we had to sell
The memory-haunting spruce tree's smell?
Don't laugh, then, at his crying need:
One small brown bug upon a weed.

★

Human Inventions Versus Animal Attainments

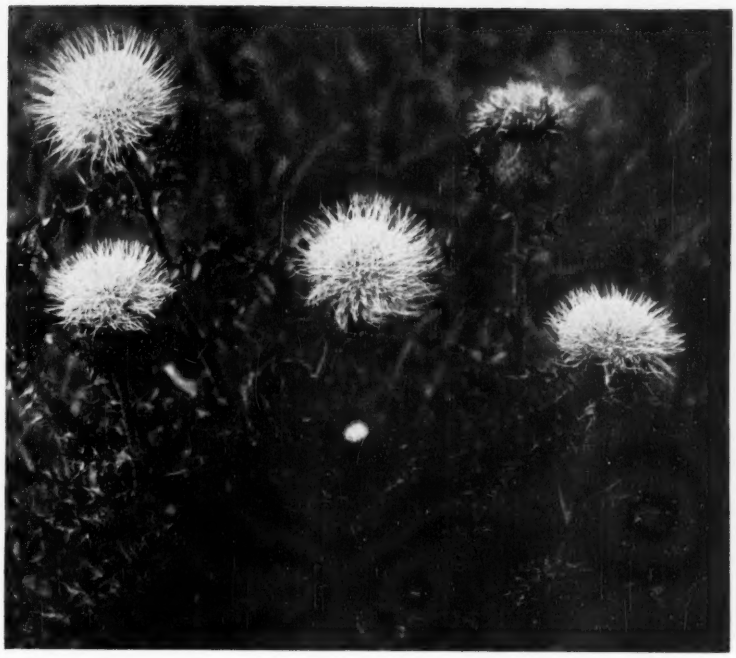
By O. B. PHILLIPS

IT HAS often been said that human beings would profit by a study of animal habits and accomplishments. This may be true, since many inventions, or something comparable, were being used by various members of the animal kingdom long before the ideas ever occurred to human beings. Below on the left is a list of inventions, while on the right is a list of animals, each of which employs in its existence something similar to one of the inventions on the left. See if you can match the animal with the correct invention. Ten correct is fair, twelve is good while fifteen or more is excellent. Answers with explanations on page 277.

1. Air conditioning	A. Young spiders
2. Embalming	B. Flounder
3. Tank	C. Bat
4. Hypodermic needle	D. Ground beetle
5. Chemical warfare	E. Flying squirrel
6. Jet propulsion	F. Rattlesnake
7. Diving suit	G. Skunk
8. Radar	H. Squid
9. Bombs	I. Water beetle
10. Glider	J. Armadillo
11. Electric chair	K. Honey bees
12. Electric light	L. Spider wasp
13. Camouflage	M. Torpedo
14. Balloon	N. Lightning bug
15. Fishing lures	O. Angler fish
16. Heliograph	P. Elephant
17. Needle and thread	Q. Pronghorn antelope
18. Snow shoes	R. Green tree ants
19. Water hose	S. Arctic hare
20. Soda straw	T. Butterflies

The Thistle

By MAUD MACDONALD HUTCHESON



The common field thistle, *Carduus discolor*, is one of the many thistles. Most legislated-against of all thistles is the Canada thistle, actually an immigrant.

TINY "lances" at every leaf-point ensure protection to the thistle. It is to be seen, rather than touched, for "thistles and thorns prick sore." Although it is the devil's own plant and the farmer's scourge, it nods its head proudly as the national flower of Scotland. As for the down, by which thistle seeds are blown abroad, it is the accepted symbol of lightness. A less admirable quality that it connotes is instability.

The thistle is beloved of winged creatures. Bees and butterflies delight in dipping into the blossoms where a feast lies hidden. Bees, in fact, can become slightly intoxicated on thistle nectar. "Kill me a red-hipped humble bee on the top of a thistle," is a command of Bottom to Cobweb in *A Midsummer Night's Dream*, and one of Shakespeare's few references to the thistle.

The Bible mentions it frequently. "Do men gather grapes of thorns or figs of thistles?" is a familiar quotation. The question immediately follows the pertinent statement "Ye shall know them by their fruits." After Adam had fallen from grace he was told "thorns and thistles shall it (the earth) bring forth to thee; and thou shalt eat the herb of the field." Israel's punishment for impiety was to see the high places destroyed, and "the thorn and the thistle . . . come up on their altars."

A member of the largest flower family, the *Compositae*, the thistle is related to the aster, daisy, cosmos and goldenrod. In botanical circles it is generally classified with the genus *Cirsium*, and since more than one-hundred species are widely distributed throughout the northern hemisphere, a complete list of thistles would be formidable.

Thistles are not in high favor with either city folk or farmers, but the prize for unpopularity goes to the Canada thistle, whose rose-purple or whitish clusters of flower heads are common in fields and along the roadside. Despite its name, it is a native of Europe and has become naturalized in the new world. Its "running" rootstocks take tenacious hold on the soil and make eradication a particularly difficult process, and when it "fruits" the fine feathery seeds are swiftly wind-borne to annoy new areas. The Canada thistle enjoys a dubious distinction in being one of the most legislated-against of weeds. In some States it must be cut back by a certain date and a penalty attaches to the sale of seed in which it is found. As recently as August of 1951 it was one of the noxious weeds included in a federal control program proposed for the western States.

If old writers are to be relied upon, some species of thistle can be commended as a vegetable and pot herb — minus the thorns. Astonishing claims are made for it in the role of medicine. It can "change the blood as the season advances," and cure such diverse ills as ague, jaundice and the itch. The Carline thistle is so-called because Charlemagne used it to rid his soldiers of the plague.

According to legend, a thistle carried in one's pocket, guards against evil, perhaps because it is a protege of Thor, the Thunder God, who protected its wearers.

One of the proudest Orders of Knighthood is Scotland's Most Ancient and Most Noble Order of the Thistle, the Regalia of which is shown here.

The thistle has been the national emblem of Scotland for over 1000 years. The story goes that the Danes were invading the country, under cover of a dark night, and all was going according to plan, when one of their soldiers stepped, bare-footed, on a thistle. His yell roused the Scots, who promptly put the enemy to flight.

"The Thistle and the Rois" (rose) is a poem famous in Scottish literature, written by Poet Laureate William Dunbar in 1503, to celebrate the marriage of Margaret Tudor, daughter of England's Henry VII, to the Scottish King, James IV.

A gold coin of the late sixteenth century was the thistle crown, which bore on the obverse a rose, and on the reverse a thistle, both crowned.

One of the proudest Orders of Knighthood is Scotland's Most Ancient and Most Noble Order of the Thistle. Its origin is lost in the mists of antiquity, but accredited to King Achaius, "of glorious memory." The Order was "revived" by James VII in 1687, re-established by Queen Anne in 1703, and the number of Knights increased from twelve to sixteen in 1827.

The Star of the Order, worn on the left breast, is a St. Andrew's Cross of silver embroidery, with rays emanating from between the points. The green thistle in the centre, on a gold field, is encircled by the motto *Nemo me impune lacessit* — No one provokes me without paying for it! (with impunity.) The handsome gold collar of the Regalia is formed of thistles alternating with sprigs of rue, that herb o' grace and memory. The badge, pendant from the collar, is a figure of St. Andrew. Rich green velvet comprises the mantle, which is tied with cords and tassels of green and gold. The hat, which is of black velvet, is like a large "tam," ornamented with white osprey plumes.

The installation of Queen Elizabeth as a Lady of the Thistle was held in 1937 during a royal visit to Edinburgh. The ceremony took place in the exquisite Thistle Chapel, of St. Giles Cathedral, and Her Majesty vowed to be "loyal and true to my sovereign lord the King and the brethren of this Order" and "never to bear treason about in my heart."

In the arms of the Scottish Strathmores, Queen Elizabeth's own family, the thistle occupies a dominant position. The crest is formed of a richly habited lady "holding in her right hand the royal thistle."

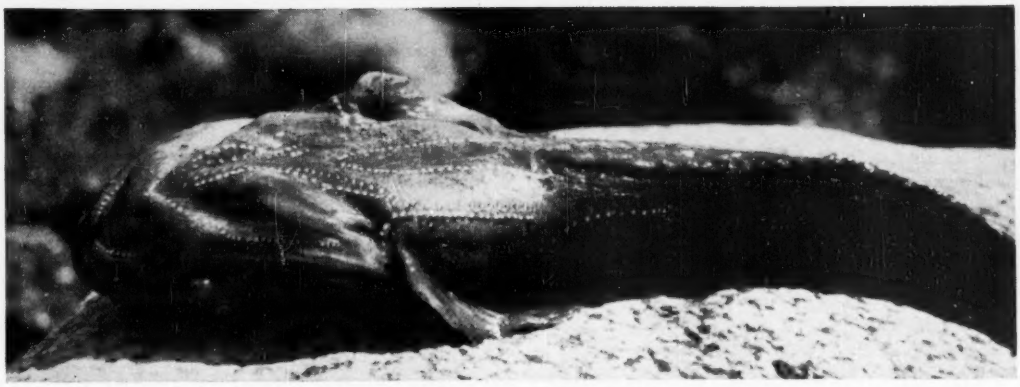
Dewy Webs of Early Morning

By WILLIAM M. HARLOW

You have crawed out of your bedroll in the gray light of dawn, struck a match to light the twisting curls of a small handful of yellow birch bark, and smelled the pungent aroma of the smoke rising in the clear cold air. Now you momentarily warm your hands as the kindling above the birch bark begins to blaze; and then drink a noggin of crystal-clear mountain water from the springhole.

Breakfast over, you shoulder your pack, and start across an open, grassy clearing. The sun is climbing over the tree tops and shining at a low angle against the dew-drenched grass; and then you are suddenly aware of myriad silvery webs glistening in the sunlight.

Get out your camera; there is perhaps nothing more beautiful than the dewy webs of early morning. To capture them, point your camera as nearly as possible at the sun, without actually having it shine into the lens. Try several exposures; one of them will be "right." Remember that the way to get a good picture is to take ten and then to throw away all but one!



The under side of the toadfish, showing the design of bright, luminous dots that account for the names of "Little Policeman" or "Midshipman" given this fish.

Little Policeman of Puget Sound

By ERNEST B. BERTELSON

EACH spring there swims up out of the depths of Puget Sound a strange little fish, scarcely known to white residents of the region, but familiar to the Indians, who call it, the "Little Policeman," because it has on its gray belly an intricate design of luminous dots which resemble metal buttons on an officer's uniform. For the same reason it is often termed, "Midshipman," in books on fishes. Scientists classify it as a toadfish, a much less exciting name.

The little fish plays no part in commercial economy. However, it is much sought after by elderly Indians, who consider its meat a sort of spring tonic. Indeed, Puget Sound natives once thought they could not go ahead with their summer cycle of root-digging and clam-gathering until they had fortified themselves with several messes of this fish's sweetly flavored flesh.

May and June are the months when the "Little Policeman" leaves the dark depths of several hundred feet, which is its habitat for the other months of the year. It migrates into the bright, shallow water along shore and secretes itself beneath rocks. Here it remains after the tide recedes, busying itself with fanning out a shallow water-filled depression under the rock roof. It then plasters the underside of its shelter with a patch of yellow, translucent eggs, each about the size of a small pea. Over these it stands guard when the water returns, darting out to drive away crabs or other predators.

Indians, when searching for the fish, watch for the sandy, fanned-out appearance of soil about a small opening

A Puget Sound native, member of the Suquamish tribe holds one of the fishes and a rock that covered a shallow pool. Adhering to the rock is a patch of the toadfish's yellow, translucent eggs.

at the under edge of boulders, which betrays the spawning place of a "Little Policeman." When such a spot is found they thrust a slender stick into the hole and if the fish is there it emits a series of short rapid grunts. This sound has caused this fish also to be called a grunter.

If the rock is small it is overturned, and the little, dark, bullheadlike fish is picked up. Its patch of eggs is scraped off with a clamshell, as Indian like them too. The "Little Policeman" is never more than fifteen inches long, and averages about ten inches. When the rock is too large to be moved, Indians fasten a small fishhook on to a stick and hook out their prey. Strange, ugly, "Little Policeman," perhaps as its use as a spring tonic for elderly Indians passes, it will be allowed to live its obscure life undisturbed.

★

Olaus Murie Awarded Leopold Medal

OLAUS J. MURIE, President of The Wilderness Society, was given the Leopold Memorial Award of The Wildlife Society at the North American Wildlife Conference in Miami, Florida. He was the second recipient of this honor, the first award having gone to Carl D. Shoemaker, Conservation Director of the National Wildlife Federation. In presenting the medal, Warren W. Chase, President of The Wildlife Society, read the following citation.

"The Leopold Memorial Medal is the highest award The Wildlife Society has in its power to bestow. It is given in recognition of a life of outstanding service to the cause of conservation.

"This year the Society has great pleasure in honoring one of the world's leading naturalists. Through a long and busy life he has known the snowy wastes of the tundra, the Aleutians of storm and fog, the majestic beauty of the Rockies and the cathedral hush of the Olympic forest. He has made part of him, the most intimate details of the lives of their wild occupants. Trailwise, resourceful and courageous, he has lived with the animals he studied in a way few men could.

"Through a professional life associated in turn with the Oregon Game Commission, the Carnegie Museum, the Biological Survey, the Fish and Wildlife Service, and The Wilderness Society he has consistently used his knowledge, balanced judgment and great personal charm and enthusiasm to the advancement of sound conservation.

"He has fought steadily and effectively for the persecuted species in our fauna, staying the unthinking hand from the sacrilege of an extinction

"As a writer and lecturer his skill has brought to a wide audience a greater knowledge and appreciation of our larger mammals and has served to elucidate and interpret the complexities of their lives.

"In recognition of his inspired contribution to the cause of wildlife conservation, as scientist, counsellor, author, artist and leading champion of the wilderness unspoiled — for the rededication of man — I have the greatest pleasure in awarding the Leopold Medal to Olaus J. Murie."

The committee on the 1951-52 award comprised Ian M. Cowan, Frank C. Edminster, Lloyd L. Smith, Harlow B. Mills and William M. Longhurst. Mr. Cowan was the author of eloquent citation.

Panorama of Mud Pots near Niland, California. Note the steam between two platforms in the center background. Most of these craters are active and, at times, they are somewhat taller. Colors are mostly dull browns, grays and greens, touched with grayish-white.

Where the Earth Burps

By EVALYN SLACK GIST

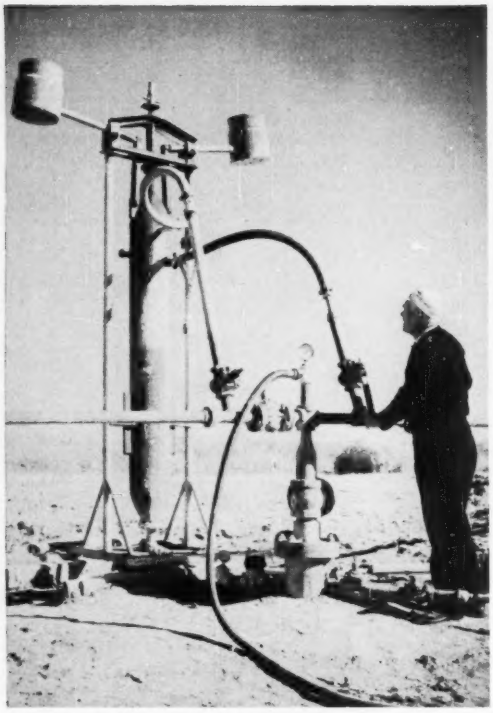
Photographs by M. B. Gist

IN ALL the great dominion of Nature few forces are more awe-inspiring than those of volcanic origin. From the beginning of history volcanoes have filled the human heart with fear, curiosity and an insatiable desire to explore.

Located along the southeastern shore of the Salton Sea, about five miles from Niland, California, is a volcanic area that is perhaps the most interesting spot on the whole Colorado Desert. Here small volcanoes rise, not of fiery lava, but as boiling mud pots, building their rims higher and higher until some flatten of their own weight. Within these small craters the mud burps sullenly, and great, shiny, mud-coated balls of gas rise and plop as the gas escapes. Scalding steam fizzes and whistles constantly through the mud in a dozen places, and there is a sulphurous stench.

Mullet Island, at the upper end of the area, is a huge volcanic pile of rocks. At one time the mud bank northwest of the island oozed highly colored clay in perhaps a dozen "Paint Pots." In 1906 the Colorado River broke through its levee near Yuma, filling the Salton Sink. Both the Paint and Mud Pots disappeared beneath the water, leaving Mullet Island actually an island. Today the Paint Pots are still beneath the Sea, with the exception of the Iodine Well, a crusty, reddish-brown pit. However, Mullet Island is again a peninsula and the Sea has evaporated until the Mud Pots are once more exposed.

Almost directly north of this area (less than five miles), are the Carbon Dioxide Wells from which a mixture of gas, mud and steaming water comes, so hot you cannot bear to touch the pipes with your naked hand. This gas is carried through a heavy pipe to the Cardox Western plant in Niland. Here, through a compressing and liquefying process, it is turned into sixty-pound blocks of dry ice, used in all types of low temperature refrigeration. Liquid carbon dioxide is also produced for fire extinguishers and carbonated



Carbon dioxide well near Niland. There are between 15 and 20 of these wells, the first being drilled in 1932. Exploratory wells have penetrated to 2700 feet, but production is at an average depth of 800.

beverages. According to local information, this gas supply was first discovered by engineers drilling for water during the early days of railroad activity in this area.

About sixteen miles northwest of the Carbon Dioxide Wells, still along the shore of the Salton Sea against the All American Canal and the Chocolate Mountains, engineers of the United States Reclamation Bureau, while drilling for water in 1939, struck a hot mineral gusher at 305 feet. From it flowed two cubic feet of water per second, with a temperature of 174 degrees Fahrenheit. Since the water was needed for washing gravel used in building the Mecca Branch of the All American Canal, the calcium carbonate content made it useless. The well was capped off with a heavy concrete base and an enormous valve. Before long the corrosive action of minerals, coupled with extreme heat, ate away portions of the valve. A small river of hot water is now gushing toward the Salton Sea some three miles away, building gorgeously colored banks in shades of golden-tan, rust, cadmium yellow, apple green and creamy white, similar to those at Mammoth Hot Springs in Yellowstone.

Science gives an interesting explanation that links the Mud and Paint Pots, the Carbon Dioxide Wells and the Reclamation Bureau well. It seems the entire area lies astride an extension of the San Andreas fault, which has been largely responsible for the earthquakes and structural features of California. Scientists believe that the highly mineralized water from the Salton Sea seeps through honeycombed strata, finally coming in contact with super-heated rocks deep down. Steam and gas forms, finding its way to the surface at the mud volcanoes.

The mud volcanoes were first reported by Professor William P. Blake in 1853. He came upon them during exploration for a suitable railroad route from the Mississippi River to the Pacific Ocean. Obscure accounts credit a Major Heintzelman and Doctor J. L. LeConte with having visited them in 1850 while the former was stationed at Fort Yuma.

In 1857, Doctor J. A. Veatch visited the volcanoes, reporting steam jets issuing from conical mounds varying from three to fifteen feet in height. He said some were sharp and slender while others were dome-shaped, apparently having been flattened by their own weight. Then, as now, the steam came from some in a continual rush. Others appeared to be active intermittently. Dr. Veatch speaks of some craters shooting mud and water into the air a hundred feet.

When Professor Hanks, state geologist, visited the volcanoes a few years prior to 1906, the ground gave way and he was immersed in scalding water and mud nearly to his shoulders. With the help of a companion he was able to escape, but for a while it was feared he had been fatally scalded.

The U. S. Reclamation Bureau well. To cap the well of hot water a concrete base and heavy valves similar to those used on high-pressure oil wells were installed. Leakage of calcium carbonate formations made gorgeously colored deposits.

Twin gas balls just rising. The mud in this pool is a rich chocolate-brown with tinges of green. In the background are dormant and extinct craters.

George Wharton James, California historian, nearly had a similar experience on his first visit, but he threw himself flat on his back and escaped injury. On his second trip in 1906 he speaks of a wild rush of steam and the hollow boom of the mud explosions, as well as the odd slurping sound of the boiling cauldrons of quicksand. At that time he waded through a shallow pond of salt water to reach the volcanoes. Then, as now, there were more than one hundred vents, some no larger than a pencil, from which steam or tiny gas bubbles rose.

In July, 1919, Captain C. E. Davis, who ran Mullet Island as a resort and hunting club, gave the following story to *The Date Palm*, Indio, California, newspaper. He said: "At two o'clock on June 26th there was a sudden sizzling roar and a shaft of black substance, looking like an oil gusher, shot about 70 feet into the air for better than two hours. It then subsided to ten feet, finally dying away entirely." Mr. Davis went on to say he believed the new vent relieved the valley of an earthquake.

It is interesting to note that Captain Davis, now dead, used the natural pigments from the Paint Pots northwest of Mullet Island to paint a series of crude canvases dealing with the desert, as well as with the adventures of the illfated Donner party, in whose history he was greatly interested. Cracked and dusty, these paintings may still be seen in the tottering old museum on the island, an excellent example of the colors once prevalent in the natural paints of the region.

Early in January last year we made a visit to the Mud Pots, the first in more than twenty-five years. We found them comparatively quiet, some dormant and others apparently extinct. Locally it is believed that the continual escape of carbon dioxide gas from the sixteen Cardox Western wells has somewhat reduced the pressure. Narrow plank walks, built in Captain Davis' day, and little raised platforms over the chemical mud lakes, permit such observations under fairly comfortable conditions.

Two weeks later we made another trip, hoping for better pictures. We were fortunate. A dozen or more pots were seething and numerous steam jets hissing. In the stew pots, balls of mud-coated gas rose slowly through the velvety masses, to break in great chocolate colored waves, releasing a sulphurous stench. Around some of the steam jets, tiny stalagmites from two to five inches high, stood like golden-yellow, brown and greenish-gray little forests. Tiny bubbles fizzed upward through small salty lakes, and one beautifully shaped, grayish-green "vase" burped intermittently. So, it would appear, the pots have periods of greater activity.

According to George Wharton James, the Indians believed that the area was the abode of evil and malignant spirits. As we watched and listened and slipped dangerously on the mud when we left the walks for closer pictures, we wondered if perhaps they might not have been right.

One of the gas balls has burst, liberating a sulphurous stench.

Listeners to the Wild

By HELEN KITCHEN BRANSON

Helen Branson is a wife, mother, psychologist, nurse and lover of Nature. She is also sightless. She has taught, zoology, botany and comparative anatomy to crippled children, works in the field of child counseling, and does psychiatric work with mentals and alcoholics at the sanitarium she and her husband operate on a non-profit basis. Against such a background her words here take on a special significance.

PINE squirrels will always be happy, exhilarating creatures to me; happy because they ushered in the most glorious days of my childhood, days in the woods with my father. The exhilaration comes because, even now, I can stimulate that irrepressible surge of energy that comes with the bright morning air of the high central Idaho mountains.

Memories like these are essential to every family; are a part of every well adjusted person's life. They are not exactly the same memories, of course, but they are memories of a oneness with Nature, a feeling that somehow each man and each living creature belong to the universe.

We talk so much of security for our children, of economic security, of the emotional maturation that makes us "grow-up" and take over the responsibilities of adult life. Our prisons and delinquency homes and mental hospitals are filled with people who lack the "security," people who feel unwanted, unstable and at odds with the world and all things in it.

There was a time when our forefathers lived close to Nature; when, as a matter of course, a boy went out to track in the woods and to appreciate the beauties and wonders of wild creatures. True enough, they killed and in some instances laid waste our flora and fauna, but for the most part these people developed a sense of belonging to the world, a feeling that carried them through life with sturdy assurance. Today we have no such automatic opportunity for our children to acquire these natural emotional securities. We must make an effort to bring them to our young people, not as wanton waste merely for "sport," but with deep and true appreciation for the lessons of life that Nature can tell more aptly than we.

All children are by instinct Nature lovers. Unconsciously they respond to the baby animal in the nest or the bird with the broken wing. There is no way in which sex can be more accurately evaluated than through observation of wildlife. The mother bird on the nest, the father bringing her food; here we have the responsibilities of the home. We see the roe of the fish, like so much jellied candy in the water of the stream. This is the way life begins. What more beautiful setting than a high mountain with towering firs, and with streams that wind in and out among the rocks, where grow water plants of just the right sort to illustrate life to children.

And if there are no mountains, there are gardens. Even the largest cities have parks, and while these may be artificial, they do offer opportunities for adventures and for lessons that we must not overlook. The hummingbird with the nest in the rose bush; the bee that carries pollen from flower to flower — such bits of Nature are beautiful and frank and creative. We must not overlook our opportunities to point out these things to our children.

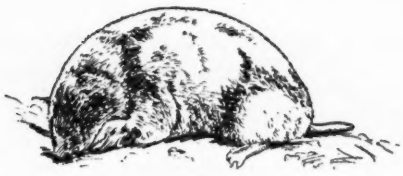
To the parents of the handicapped child there is a special challenge; or to the handicapped parents of normal children. Crutches, or seeing-eye dogs, or even wheel chairs, should never be the excuse of neglecting the presentation of Nature and her relation to human adjustment.

Yes, the squirrels scold and the birds still sing to me, although I cannot see them. The flowers send me sweet fragrance along my way. The wind touches my hair and the murmuring evergreens give me peace. No longer can I see the greeness of the hillside or distinguish the brilliant colors of the red-winged blackbird or the silvery Dolly Varden trout. But my husband, blind from early childhood, has learned many of these things, and we do not allow them to stand in the way of showing our children what we can glean through listening and through their eyes.

I am convinced that walking is the best way to study Nature. Cars and trains and buses have their value in getting people to key points. But it is only the person on foot who really sees, hears, feels and smells Nature untainted. The timid deer stands petrified by the whir of the automobile. But relaxed and quietly eating, her fawns close by, the doe is the perfect picture of quiet, harmony and gentleness. The stately elk with his antlers high is worth the tramp far into the sections of woodland unreached by automobile and logger's saws.

I shall always remember my experience with a Girl Scout Troop, one of several with which it has been my privilege to work. It was a group of girls, mostly delinquents, and some of whom had been confined in correction homes. It was my job to assist them in adjusting to a life that had already dealt them cruel blows, although few of them were past fifteen years of age.

I remember the first day I stood before them. They seemed a sullen, silent, resentful pack of animals. I almost trembled as I thought; "You may have succeeded with things like this before, but you were a fool, Helen Branson, to tackle this bunch of kids; you who can't even see what (Continued on page 274)



COMMON EASTERN MOLE

WESTERN MOLE

HAIRY-TAILED MOLE

STAR-NOSED MOLE

PYGMY SHREW

WATER SHREW

Moles, Shrews and Bats

By E. LAURENCE PALMER

This is the sixty-sixth in NATURE MAGAZINE'S *series of educational inserts.*

HERE is a group of mammals that should bring great satisfaction to those naturalists who revel in the matter of adaptation. Bats are adapted to flight, the moles to digging, and the shrews to getting about on the ground, in trash and in trees. I, personally, get a thrill when I see how these creatures, so different in structure and habit, fit into Nature's scheme of things.

There are few natural environments where some member of this group cannot be found. They have been seen hundreds of miles at sea. They burrow in earth, swim readily in water, enter little holes in trash, and fly through the air over waterways, in forests, in our larger cities, and over fields. Of course, no one specie of the group does all of these things. Bats do not burrow any more than moles fly. And there is no doubt but that the animals in these groups are more abundant than most persons realize. Some species may range widely over the continent, while others have a decidedly limited range.

Probably the most conspicuous differences in these groups are associated with their different types of locomotion. Our moles have powerful forelegs backed by strong shoulders, and pointed noses. These all simplify the work of burrowing through loose earth. The hair of moles may be rubbed either way without affecting the sleekness of the pelt. This simplifies going forward or backward in a burrow. The star-nosed moles, with their finger-like nose parts, are particularly suited to burrowing in soft, wet earth.

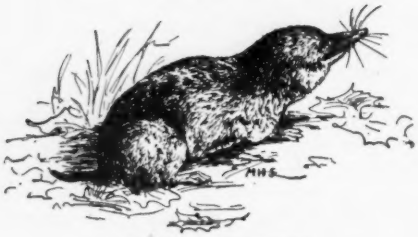
Locomotion for bats is remarkable when it is realized that they can fly without harm in the night through the twig-filled forest where their insect food may be in flight. How they do this was a secret only relatively recently conclusively solved. The answer was suspected as early as 1790 by Spallanzani. This will be developed later in this article.

Shrews usually confine their activities to the loose trash that lies on the ground in their hunting area. The water shrews find their living in the water. For this they have virtually webbed toes. Hairs between the toes increase the paddle effectiveness of these structures. Animals like shrews, whose digestion may be so rapid that food eaten at noon may have passed through the alimentary canal by 1:30, must keep busy to avoid starvation. The shrews seem blessed with boundless energy and are able to stand the pace. As a rule a life span of two or three years would be long for these dynamic livers.

Anyone going through brush and forests at night is likely to tear his clothing. We frequently hear the expression "blind as a bat," and yet bats can go with ease through remarkable mazes of twigs and branches. Most of us who know bats marvel at their ability to get about safely in their world.

The eyes of moles are minute and probably of little use in the world of darkness in which they live. While night-flying owls have large

SHREW MOLE



SHORT-TAILED SHREW

LESSER SHORT-TAILED SHREW

SMOKY SHREW

MASKED SHREW

PIPISTRELLE BAT

eyes, the eyes of bats are not abnormally large. Even the shrews, which seem to be on the run most of the time, probably do not depend greatly for their safety on sight.

There is no doubt but that some of our bats, moles and shrews depend heavily on the sense of touch. Probably the master in this is the star-nosed mole, on whose nose some twenty pink, fleshy "fingers" probe their way into their surroundings in search of food. No doubt other moles can feel vibrations in the soils through which they make their way and find them useful for survival.

Of course we may interpret feeling variously. Bats can probably feel echoes and sound waves before they have come in contact with the source. We consider this ability as associated with hearing rather than with feeling.

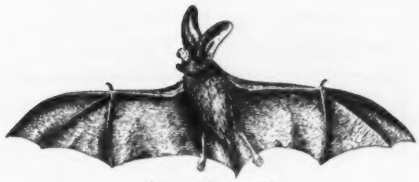
Man is insensitive to many of the reactions to feeling that are possessed by other animals. I once stood beside a stream and watched earthworms make their way hastily from underground. I could detect no reason for this activity except that nearby grass tops were waving, although there was no wind to cause their movement. A quick scoop with my hands brought a star-nosed mole out into the light. It seems doubtful if it was scent that moved the earthworm to seek escape, but that it was motivated by reactions to vibrations sent through the soil by the activities of the mole.

So far, we have not considered the matter of hearing. In the table dealing with the little brown bat we give many of the details regarding the "radar" system used by bats in finding their way about. It can be demonstrated that bats make sounds, many of which we cannot hear. When they are deprived of their ability to hear, they lose their ability to dodge obstacles in darkness. When bats are deprived of the opportunity to make sounds they also crash into obstacles. It would seem plain from this that they send and receive sound impulses that help them meet problems peculiar to their way of living.

As indicated in the tabular matter discussion on the little brown bat, a flying bat gives off protective sound signals with varying frequency. When flying in the open the calls may be given at a 25 per second rhythm, while this is doubled when the bat makes its way through a maze of tree twigs in total darkness. D. R. Griffin, specialist in bat lore, believes that bats locate flying food by their radar system, that they hear echoes from their food rather than sounds produced by their food, that they can detect inert, marble-sized objects at least six feet away and can avoid objects only a foot away while in full flight. When we think of these gifts possessed by "lesser" organisms it makes us definitely humble, as it should.

We recognize superior sensory skill as being characteristic of one or the other of the groups of animals we here consider. The bats excel in the use of their ears. The moles excel in their ability to feel things, although they also obviously have acute hearing ability. Probably the shrews excel in their ability to locate parts of their environment in some other ways. Obviously they have a good sense of hearing. While some shrews definitely have a poor sense of smelling, others may have this ability. Frequently, in the animal kingdom the possession of an ability to create a stimulus is accompanied by a corresponding ability to receive it. Bats produce supersonic sounds and are able to receive them. They are without exceptional scent although they can scent food. Obviously the eyes of shrews and moles are not of major importance to them in their daily activities. There is no doubt but that shrews have an exceptional ability to give off scents at times. This might argue that, in turn, they have an ability to use scent in exploring their habitat. It is possible that they, too, are more dependent on a sense of hearing than we

SILVER-HAIRED BAT



LUMP-NOSED BAT

LITTLE BROWN BAT

HOARY BAT

RED BAT

BIG BROWN BAT

might at first suspect from observation of the animals.

Anyone who has watched a shrew in action, which means anyone who has ever watched a shrew, realizes that they are sensitive to what goes on about them. Who can say just what sensations mean the most to them?

Just as there seems to be a nice relationship between the structure of these animals and the type of territory they inhabit, so there is an equally exact limitation as to the time when they are active. Some suspend activities at certain times in the twenty-four hours of a day. The time of the year also has its effect on their activities. A creature suited to capturing insects in the air as a livelihood must be active at the time and place, when and where its food is available.

In bats there seems to be a definite order of appearance as the daylight fades into the west. Among the first to appear may be the red bats, which sometimes may be active in broad daylight. Sometimes the little brown bat may be active even earlier in the evening than some red bats. Following these two, the silver-haired bat will probably appear, followed by the big brown bat. Still later in the evening comes the hoary bat, which is seen by relatively few persons. The major activities of each of these species of bats is limited to about an hour in the evening and another hour at dawn. Considerable overlapping of periods of feeding exists between the species. Of course the order of appearance of the species in the morning is the reverse of that suggested for the evening. The first to be active in the morning would be the hoary bat, followed roughly at half hour intervals by the big-brown bat, the silver-haired bat, the red bat and the little brown bat.

Since the shrews and moles apparently depend little on light it is not surprising that they do not restrict their activities so closely to light stimulus as do the bats.

Shrews and moles live largely in an environment where there may be some insect and small animal activity through the year. These animals, then, may be expected to be active at any time. With the bats there are definite seasonal restrictions. Some of the bats migrate north and south with the seasons. The hoary bat is possibly the most conspicuous of these. Other bats may hibernate or may migrate, with no hard and fast rule being followed by all members of the species.

Possibly the most interesting seasonal activity is that found with some of the bats. In the fall most of these animals mate. Seton, in his masterful *Life Histories of Northern Animals*, writes of the hoary bat, basing his conclusions on statements of Merriam that the gestation period is for 9½ to 10 months. He assumes that, as with other bats, the time of true gestation is the period between mating and the birth of the offspring. According to the dictionary the gestation period is the time between conception, or fertilization of the egg, and birth. If we accept this definition the gesta- (Continued on page 256)

NAME SCIENTIFIC NAME	COMMON EASTERN MOLE *Scalopus aquaticus*	WESTERN MOLE *Scapanus townsendi*	BREWER'S MOLE HAIRY-TAILED MOLE *Parascalops breweri*	STAR-NOSED MOLE *Condylura cristata*
DESCRIPTION	Length male 7-1/5 inches, with 1-1/5 inch tail. Female, 6½ inches with 9/10-inch tail. Pelt of close, gray, velvety soft fur may be brushed either direction. Tail naked or nearly so. Forefeet modified into powerful digging structures. Nose pointed. Eyes small and difficult to locate.	Length to 9 inches with tail to 1-4/5 inch and 1-inch hindfoot. Tail of male about 1-3/5 inch; of female, 1-4/5 inch. Males larger than females, which rarely exceed 8-1/5 inch overall length. Dark blackish-brown with purple highlights above. Paler beneath with brown tinge. Paler in winter.	Length to 6 inches with 1-1/5-inch tail, with males and females equal in size and similarly colored. Like common mole in general colors but with furry tail that is smallest at base and with coarser snout that is shorter. Fur also coarser than in common mole.	Length, male to 8 inches with 3-1/5-inch tail. Sexes colored alike. Tail much enlarged in winter. Blackish-brown to black above, with paler browner underparts with underside of tail often much lighter. Weight to 77 grams. Nose ending in 22 fleshy rose-colored "fingers." Legs weak.
RANGE AND RELATIONSHIP	Ranges from Massachusetts to Nebraska and south to the Gulf, taking the place of the western mole. *Scapanus*, discussed elsewhere. Found usually in loose soft ground where plants and their enemies are present. Teeth: I, 3/2; C, 1/0; P, 3/3; M, 3/3. Total: 36.	Ranges through northwestern United States from Washington and Oregon south into California, between the Cascades and Coast ranges. There are at least 4 species closely related. Work most commonly in sod-covered earth where the food needed is available.	Found from southern New Brunswick to North Carolina and west to Ohio and through southern Ontario. Varies greatly in abundance and may be more common than may be expected. One species. Teeth: I, 3/3; C, 1/1; P, 4/4; M, 3/3. Total, 44. Found to elevations of 3000 feet.	Found in damp meadows and lowlands from southern Labrador to southeastern Manitoba and south to Georgia and Illinois. One species. May be found in same area and even in same tunnels with other moles of similar distribution. Teeth: I, 3/3; C, 1/1; P, 4/4; M, 3/3, Total; 44.
REPRODUCTION	Usually solitary, but in breeding season 2 or more may be found to a tunnel. Breeds in March and 4-6 young born 6 weeks later. Young independent at 4 weeks and mature in 10 months. Nest a 5- to 8-inch grass-lined den. Probably are not long-lived and in winter may remain active.	During rutting season adults may leave burrows and move about on earth surface. Young numbering usually about 4 are born in April or May, and there usually is but a single litter a year. Young remain in nest apparently until reasonably well developed. Few young are found in burrows.	Little known of its life habits. Mates in March or April, with 4 or 5 young born a month later. Young blind and helpless at birth, but grow rapidly so that in a month they may be weaned. Become sexually mature at one year. One annual litter. Can never become an abundant animal.	May mate in fall, wintering in pairs. Male at height of breeding in January. Young, 3 to 6, born from mid-April to mid-June, became independent at 3 weeks and mature at 10 months. One annual litter. Nest an 8-inch ball lined with soft shredded plant materials.
ECOLOGY	Food choices include, in order, white grubs, earthworms, insect larvae, adult insects and plant materials. Plants may constitute 13% of total volume of food. No food storage, and daily consumption totals about 1/3 the weight of the animals. May eat corn, wheat and oats but not beans or peas.	Food largely insect larvae and earthworms caught by prowling about underground with assistance of nose, powerful shoulders and digging legs. They disfigure lawns in search of grubs that destroy lawns, and injure vegetables in search of insects that destroy vegetables.	Food largely earthworms and insects. May eat more than its weight in earthworms in a day, but major food may be beetle larvae caught underground during burrowing activities. May also eat ants and other small invertebrates. Burrows may be used by mice that may destroy vegetable crops.	Active night or day through the year and sometimes in groups. Food includes basically about 50% earthworms and 1/3 insects with the rest miscellaneous. Detects food by nose parts, probably by contact since sense of smell is poor. Hearing is excellent. Forefeet capable of digging well through earth.
ECONOMY	May injure lawns and vegetable gardens but since 50% of food is insects it is probable that the animals are basically useful. Earthworms may comprise 31% of food. Enemies include large predators and a louse, a beetle, a flea, and threadworms that act as parasites.	Probably fundamentally useful but do some damage in being useful. Formerly used as fur to limited extent. Teeth: I, 3/3; C, 1/1; P, 4/4; M, 3/3. Total: 44. May be caught in traps or dug from ground when detected at work building tunnels. Related smaller *Neurotrichus* has teeth: I, 3/3; C, 1/1; P, 2/2; M, 3/3. Total; 36.	Of little economic importance although it may injure lawns and golf links. Greatest economic value lies in destruction of burrowing insects that are destructive of grass and other plants.	Of neutral value. More interesting to naturalists than to others and since it occupies soil normally too wet for agriculture it does not raise the ire of farmers and lawn keepers as do its relatives that live in drier grounds.

SHREW MOLE *Neurotrichus gibbsii*	SMOKY SHREW *Sorex fumeus*	WATER SHREW *Sorex palustris*	PYGMY SHREW *Microsorex hoyi*	LESSER SHORT-TAILED SHREW *Cryptotis parva*
Length to 4½ inches with female slightly larger, tail to 1½ inches. Smallest American mole. Fur, iridescent, fine, close, dark gray above, to purplish with underparts slightly lighter. Toes not webbed. Snout long, with naked tip. Usually found in dry soft soil.	Length to 5 inches nearly 2/3 being tail that in adults is smooth and round-tipped in young with pencil of hairs on tip. Weight to 11 grams. Dark gray in winter and lighter beneath. In summer browner, paler and to silvery beneath. In breeding season tails may be swollen to twice normal size.	Length to 6-2/5 inches for either sex, with tail nearly 1½ inches long. Hind feet unusually large and broad for shrew with 3rd and 4th toes hair-fringed and somewhat webbed. Dark brownish-black above in winter and paler and browner in summer, with tail differing in color above and below at tip.	Length to 3½ inches with tail over 1 inch. Weight about 4 grams. Reddish-brown above, smoky gray beneath. In winter darker olive-brown above. Tail obscurely two-colored above and below but darker at tip. Ears inconspicuous. Eyes small but distinct.	Length about 3½ inches, with tail to over 3/5 inch. Much like a small short-tailed shrew. Eyes hidden in fur and almost invisible. Brown-gray to slate, silvery beneath in winter. Tail conspicuously lighter beneath. Weight, under 5 grams.
Ranges from southern British Columbia south into Washington, Oregon and California with 2 subspecies recognized. May be found in much the same territory as that the supports the western mole. Teeth: I, 2/1; C, 1/1; P, 3/4; M, 3/3. Total: 36.	Closely related to common shrew but about 1 inch longer, with more prominent ears. Over 30 species of *Sorex* in North America. Smoky shrews range from Carolinas to Tennessee and north into Canada. Teeth: I, 4/2; C, 1/0; P, 2/1; M, 3/3. Total; 32. Favors deep leaf mold and stumps for range.	Ranging through colder parts of North America from coast to coast and represented by 5 subspecies, Nova Scotia, Great Lakes, Rocky Mountain, Richardson, (Rocky Mountains to Minnesota) and white-chinned (Pennsylvania to Labrador).	Found from the Carolinas to Wisconsin, discontinuously, and north to the border roughly. One species in the genus with a half dozen forms recognized that extend range nearly to Pacific Coast and on up to Alaska. Teeth: I, 4/2; I. 1/0; P, 2/1; M, 3/3. Total; 32.	Ranges from New York to Florida and through mid-West with 17 related species, all but two being tropical three being within the borders of the United States. Teeth: I, 3/2; C, 1/0; P, 2/1; M, 3/3. Total; 30. Compare with total for the similar *Blarina*. Usually a rare species.
Little is known of life history but it is probably much like that of other moles. Usually known as Gibbs Mole.	Young, 4 to 7 born blind and naked in April, with 1 or 2 other litters during summer and adults probably die in second year after breeding season. Abundance varies greatly in places and at times but animal is active throughout its life, day or night, summer or winter.	Little known of reproduction but may have 2 or 3 litters a year, with possibly to 7 in a litter but the details are apparently not well known. They are probably short-lived like their close relatives. Teeth: I, 4/2; C, 1/0; P, 2/1; M, 3/3. Total; 32.	Habits of this rare animal are not well known, but the mother bears several litters of young a season, with probably 5 or 6 to a litter. Probably the major reproductive habits are not unlike those of the better known *Sorex*. There is need for much more information on this genus.	Nest a ball of shredded vegetation often occupied by to 5 adults. Nest to 5 inches in diameter. Several litters a year beginning in March with to 6 young in a litter. Young are weaned at about 3 weeks. Probably is not long-lived, but remains active through the year like other shrews.
The shrew mole probably spends more time on the ground surface than its relatives and its burrows are, of course, smaller than those of other moles. Food largely insects.	Food, any animals it may overcome but chiefly insects, salamanders, earthworms, sowbugs, centipedes and some plant material. Enemies may include other shrews, possibly moles, cats and other preying creatures, such as weasels, foxes and hawks and owls.	Food undoubtedly small animals of waterways, egg and young of fishes and many kinds of water insects that may be useful to fish. They swim readily and well using all 4 feet to keep submerged and rising to surface when desired. Pelt is highly water-repellent. Can run on water-film.	Food unquestionably small animals like insects and earthworms. Fourth upper incisor small and almost hidden as contrasted with that of the genus *Sorex*. Hawks, weasels and other predators are the chief enemies.	Food largely insects and earthworms, but will eat vegetation in captivity and probably when free. Hard parts of insects may go through alimentary canal in 1½ hours. Enemies include cats, owls, foxes, snakes, weasels but it may kill snakes as large as 9 inches in length.
Of little economic importance because of its limited range. Of great interest to biologists largely because of its close relationship to *Uro'richus* or other small moles of Eastern Asia. Well worthy of close study as to habits and behavior.	Probably serves a useful function as destoryer of small animals that are enemies of plants that are useful to us. They do not get along well with each other, apparently, and live more or less solitary lives, desperately seeking the food they must have.	May be useful in controlling some water insects that may be enemies of fishes but may also be injurious to fishes. Of doubtful economic importance in either direction. Eskimos are highly superstitious about shrews and may refuse to cross their trails knowingly. The Crees of the Norway House region call it the Beaver mouse, since it may winter in beaver lodges.	Probably useful as a destroyer of insects although may destroy useful animals as well. This little animal has a strong odor from its side glands much in excess of that given off by some of its larger relatives. Possibly because of this cats bring these and other shrews in uneaten.	Probably of little economic importance but of some definite value and of great scientific interest. Does not yield easily to confinement and requires constant attention to survive under such conditions.

NAME SCIENTIFIC NAME	BLARINA SHORT-TAILED SHREW *Blarina brevicauda*	COMMON SHREW *Sorex cinereus*	LITTLE BROWN BAT *Myotis lucifugus*	SILVER-HAIRED BAT *Lasionycteris noctivagans*
DESCRIPTION	Length to 5 inches with tail of 1 inch. Weight around 20 grams varying from 12 to 27. Sexes superficially alike. Stout. Eyes small. Fur soft. Nose pointed and active. Dark slate-gray above and lighter beneath. Paler in summer. Tail black. Sheds hair in March and October.	Length to 4 inches including tail to 1-3/5-inch. Weight to 3-3/5 grams. Sexes apparently alike. Brown sprinkled with lighter hairs above and grayish buff beneath. Ears almost hidden in fur and eyes also inconspicuous but minute. Tail yellowish brown and slender. Teeth colored.	Length to 3-3/5 inches with 1½-inch tail and 1½-inch forearm. Face furry. Has appearance of being a slender bat. Ears laid forward reach to nostrils. Sexes colored alike with little seasonal or age change. Dull brown above and lighter beneath. Weight 4 to 5 grams or equal to a nickel.	Length to 4 inches with 1-2/3-inch tail and 1-2/5-inch forearm. Ear 2/3 inch from crown, relatively large. Sexes colored alike without seasonal or great age variation. Dark chestnut-brown above, tipped with silver white. Under parts like upper but not so abundantly silver-tipped.
RANGE AND RELATIONSHIP	Found in fields and roadsides, in farm buildings and wooded areas usually where there is a loose trash cover in which food may be found. More than half a dozen species or subspecies which range through eastern North America. Teeth: I, 4/2; C, 1/0; P, 2/1; M, 3/3. Total; 32.	Closely related to smoky shrew and water shrew. Ranges through most of North America, being found in open fields, on forest floor and elsewhere. Probably most common, and widely distributed of America's ninety odd shrew species. May go up trees but more common on ground. Teeth: I, 4/2; C, 1/0; P, 2/1; M. 3/3. Total; 32.	Ranges widely over water, fields or wooded lands or in towns and in buildings. Found throughout most of North America from Labrador to Alaska and south. Some 30 recognized subspecies. There are over 2000 kinds of bats in the world. Teeth: I, 2/3; C, 1/1; P, 3/3; M. 3/3 Total, 38. Has good homing instinct.	Common about waterways flying early in evening or just after sunrise. Ranges through most of northern America north of Mexico, but not breeding in southern part of range. Males may range much farther north than females in summer months. Teeth: I, 2/3; C, 1/1; P, 2/3; M, 3/3. Total 36. One species.
REPRODUCTION	Young born 3 weeks after breeding, 4 to 8 in a litter, several litters a year. At birth like pink, wrinkled honeybees. At 1 day, 30 mm.; at 1 week, 60 mm.; at 2 weeks 73 mm.; at 3 weeks, 90 mm., weaned. Half-grown in 1 month. Mature in 6 months. Aged at 16 months. Mates for season.	Females may live with males but drive them out when bearing young. 5 to 9 young born blind and helpless about 3 weeks after breeding, with to 3 litters a year. 1 day old young is hairless, about 1/35 weight of mother, 4/5 inch long, with 1/8 inch tail.	Mates promiscuously in fall, but actual fertilization usually delayed until spring. Young weighs about 1½ grams at birth which takes about ½ hour with gestation about 56 days. Nurses for 3 weeks and young reaches mature size in 4 weeks. Males breed at 14 months; females at 10 months. Fly at 3 weeks.	Definite segregation of sexes during period in which young are developing. Young number 1 or 2, born in late June or early July, black when born but grow rapidly as do other bats and in 3 weeks may be flying, be weaned and have begun independent existence, although at first flight is weak.
ECOLOGY	Food largely insects being nearly half by bulk in 244 specimens examined. Food included also mollusks, earthworms, occasionally salamanders, and sometimes to 12% plants. Nest kept clean, under ground, lined with fine vegetable material. May store some food. Has poor sight. Many enemies include cats, owls, foxes, and other predators.	Food mainly small animals captured by incessant hunting day and night through the year. Eats 3½ times its weight in a day. Has good sense of hearing but poor sense of smell and sight. Can jump 4 to 5 inches standing and to 6 inches when running.	Home range may be 100 miles with winter rest in caves. Food insects caught on wing. Gives off sounds (50,000 to 98,000 c.p.s.) while flying and is guided by echoes or radar effects. Calls at 25 per second in open, 50 per second in trees. May fly 30 miles in search of food and roost with other bats.	Food probably exclusively insects. May hibernate or migrate and has been seen far out at sea. It is a common species, sometimes being the commonest, but abundance may be erratic at a given time or place. This may be due in part to the sex segregation.
ECONOMY	Useful insect destroyer, one record showing 60% of a year's crop of destructive larch sawflies were killed by blarinas. Reputed to have poisonous bite comparable to that of cobra. Makes a difficult pet. Active the year round day or night. Gives off offensive odor. Worthy of protection.	Highly useful as insect destroyer. May carry mite parasite possibly associated with distribution of spotted fever. Bite may be poisonous but not seriously so to man. Reputed to be vicious but this may be questioned. Relatively short-lived.	Useful as insect destroyer. Body parasites including fleas do not favor man as host. May live to 10 years of age. Manure or guano collected from bat caves is of considerable fertilizer value, one colony producing in one year fertilizer worth $200 and weighing over 2 tons.	Undoubtedly a useful species whose habits are not greatly different from those of the associated species. Evening flight later than red bat or little brown bat and earlier than big brown bat or hoary bat. Usually begins the evening's activity, as with many other bats, with a drink from a waterway.

PIPISTRELLE. PYGMY BAT *Pipistrellus subflavus*	BIG BROWN BAT HOUSE BAT *Eptesicus fuscus*	RED BAT *Lasiurus borealis*	HOARY BAT GREAT NORTHERN BAT *Lasiurus cinereus*	LUMP-NOSED BAT RAFINESQUE BAT *Corynorhinus rafinesquii*
Length to 3½ inches with tail to just over 1½ inches. Forearm 1-1/3 inches. Weight to 6 grams. Wingspread to nearly 10 inches but one of the smallest of the bats. Sexes colored alike, without seasonal change. Light yellow-brown above but paler beneath. Hair slaty-black at base.	Length to 4½ inches with tail to 1½ inches. Forearm to 1-4/5 inches. Wingspread to 1 foot. Membrane between hindlegs not furred above. Weight to 6 grams. Uniform yellow-brown above. Thumb is large. Ears longer than broad and taper to narrow rounded tip. Membranes of wings black, not furred.	Length to 4 1/5 inches; tail to inches; forearm to 1-3/5 inches. Male orange-red with under parts paler and with less red. Females duller and with touches of chestnut. May be some individual differences in color. Ears low, broad, rounded. Has appearance of medium sized red bat.	Length to 5½ inches, with tail to nearly 2 inches. Forearm to 2 inches and wingspread to 16 inches. Weight to 35 grams the females being the heavier. Yellow-brown to dark mahogany-brown with grayish-white over whole body. Ears short, rounded, with naked black borders. Web between legs well furred.	Length about 4 inches with tail nearly 2 inches. Sexes equal in size. Wingspread to over 1 foot. Membranes of wings and tail furless. Ears bent backward reach to mid body. Brown above and more slaty beneath with fur softer than in the brown bats. Little fur on inner ear margins.
Ranges throughout eastern United States but is poor flier. Remains active until late in October being most abundant about waterways or in woodlands near waterways. Two species each with 2 subspecies recognized. Teeth: I, 2/3; C, 1/1; P, 3/2; M, 3/3. Total 34.	Ranges through most of North America with 2 species recognized. A wide-ranging species being found south into Central America. Favors settlement and towns, flying lower than the hoary bat. Individual range apparently is not well known. Teeth: I, 2/3; C, 1/1; P, 1/2; M, 3/3. Total; 32.	Found about villages near buildings or in openings in wooded lands. Common through North America south of Canda, migrating to the south for the winter months or sometimes approximating a hibernation. Moves south to Panama and north along Pacific Coast to Sitka.	From Gulf of St. Lawrence to Great Slave Lake and south to southern Mexico, summering usually north of Pennsylvania and wintering usually south of it. Essentially a woodland species flying high and late, swiftly and erratically. Teeth: I, 1/3; C, 1/1; P, 2/2; M, 3/3. Total; 32.	Ranges from the southeastern states to Vancouver Island and south into Mexico to the west. It is a cave bat by preference so far as roosting habits are concerned. Four subspecies are recognized. Teeth: I, 2/3; C, 1/1; P, 2/3; M, 3/3. Total; 36.
Sexes become segregated and females produce two young usually. Mother carries them with her on flights for the first few days but leaves them as they grow and in 3 weeks the young are large enough to take flight and take care of selves. Probably mate in fall.	Young born in mid June or earlier in South, usually numbering 2. Probably true fertilization does not take place until the spring, although mating may take place in fall. Young weigh to 3 grams at birth but grow rapidly and are weaned at 3 weeks and full sized at 2 months.	Mates probably in August flight. Females congregate in spring and true fertilization takes place with increase in temperature. Young, 2 to 4, born in June, the young being carried by mother for a few days. Young independent and flying at 3 weeks of age. Teeth: I, 1/3; C, 1/1; P, 2/2; M, 3/3. Total; 32.	Young usually 2, born by mid-June, although mating is suggested as taking place nearly a year ealier. One annual litter. Females congregate during nursing period, and carry young after birth relatively long. Young develop to independent size within a month. Hoary by 3 weeks of age.	Probably mate in fall, judging from conditions of males at that time. Single young born in late June and carried by mother as long as possible. Species does not migrate but hibernates in some suitable cave, often until late April.
Food almost exclusively insects, being largely flies, beetles and wasp relatives. Probably are not active through the night, except possibly during the breeding season, but have flights at dusk and at dawn. May begin activity early in March if season is warm.	Food almost exclusively insects caught on wing with beetles approximating 1/3 the volume with relatively few moths in the usual list. Few enemies include owls and snakes, the latter raiding roosts at times. Usually spends winter in a bat cave more or less in torpid condition.	Food exclusively insects, taken usually ½ to 1½ hours after sunset or before sunrise. Fall colony forms in October; summer colony, May to September in different places. May migrate at heights of to 400 feet, and has been found 240 miles at sea. Has good homing instinct. Usually gentle if handled carefully. Gives squeaks.	Food almost exclusively insects, Because of size may feed on larger insects than do other bats. Most active during second hour after sunset and next to last hour before sunrise. Southern migration in fall begins with the frosts. Roosts commonly in trees.	Food apparently largely moths, but probably includes other insects. The large ears are curled up in spirals like horns on rams when at rest. May find rest in hollow trees, in houses or under the loose bark of trees but favors caves as already suggested.
Usefully destroyers of insect s and probably may be considered as almost wholly useful. May be confused with large moths because of their relatively small size and slow flight as compared with some other bats.	Useful destroyers of harmfil insects and worthy of protection they do not get. Reputation as carrier of vermin overdone, if not wholly unjustified. Use sounds beyond our range of hearing to guide them in flight, being guided by echoes as are other bats described elsewhere.	Useful insect destroyer. In captivity may be fed mixture of bread, American cheese, chopped hard-boiled egg, banana, cottage cheese, unsalted vegetables and clabbered milk with broken beetles and grasshoppers to help prevent diarrhoea. Probably uses sound to guide relatively slow flight.	Unquestionably a useful species worthy of all protection. Found about settled areas most commonly in October and November. Too beautiful an animal to be shot as a sporting proposition.	Economic importance probably similar to that of other bats and primarily associated with control of insects. Evening flight beginning with late dusk and before real darkness of the night.

(Continued from page 251)

tion period in bats is surprisingly short. While the period between mating and birth may be long, it is believed that in most bats conception does not take place until some time after the mating period. Some details for the different species may be found in the accompanying tabular material. It is quite probable that Seton was not informed on this point.

Following the late summer or fall mating period, many bats may seek refuge in a winter hiding place. Commonly this is a cave where the temperature may be constantly above freezing. The bats in such a resting place may crowd each other thickly. Usually there is a high percentage of one sex in such groups. In the spring with the first activity true conception probably takes place, and in a relatively short time the young are born.

When the weather gets suitable the bats may leave their winter hiding place and take up a new resting place. Such groups of hiding bats are almost predominantly one sex or the other, disregarding the young. Certainly there are many groups of nursing mother bats with no adult males in the group at all. With the rearing of the young finished and the approach of fall, the women's "sewing circles" break up and from then on the story is different. We need not here repeat what is to be found in the tabular material on the development of the bat young.

The social natures of shrews vary greatly through the year and with the different species. Pertinent data on this may be found in the detailed matter in the tables. Suffice it to say that while some shrews are highly unsocial for most of their lives, a few species not only may live together as family groups but some groups may be composed of males and females with more than one of either sex being present. Even the antisocial species relax their habits and, during the breeding season, live with some harmony with each other. It is only natural that since the shrews are usually short-lived there may be sometimes more than one litter a year, and since this is the case it is also only natural that their lives cannot be wholly antisocial at all times.

Zoologists place moles, shrews and bats in a group known significantly as the Insectivora. This, of course, means that they are the insect-eaters. There are, of course, a few exceptions. The forefeet of the animals in these groups are for distinctly different purposes. The bats, of course, have their forefeet serving as wings; the moles use theirs for digging, while the shrews have feet apparently not specialized for digging, and certainly not for flying. The teeth of the animals are of importance in classification, and arguments that may arise as to identification generally can be settled by reference to the tooth formulae given in the chart section. The formula, of course, gives the number of teeth of the different types on a given side — I, 1/1 meaning that the animal has one incisor on the upper and one on the lower jaw on one side. C refers to canines, P to premolars and M to molars, of course. Sometimes the color of the teeth is helpful in making identification of remains found in the stomachs of enemies.

There is no doubt but that the insectivora have great economic importance. Probably none in the temperate zones are seriously harmful to man's interests. They all destroy enormous numbers of insects that may be harmful to agriculture, and only a few of the shrews ever eat any appreciable amount of plant material. This is more than earned by the great abundance of insects eliminated. The dung of bats has a high fertilizer value, and a colony of bats in a cave has been known to yield in a year some $200 worth of this fertilizer. This probably equals in value any other average agricultural crop harvested from an equal area of the earth's surface.

In the Tropics, of course, we have bats, such as the vampire bats, that are serious pests, and also have fruit-eating bats. We cannot adequately consider them here. There are, of course, superstitions that bats seek to get into the hair of humans. Such beliefs may usually cease if information is given that the food of temperate zone bats is 100 percent insects. While bats may harbor fleas and other body parasites, these little pests have specific tastes and do not voluntarily shift their activities to human bodies.

It is unfortunate that such useful animals as moles, shrews and bats should have fared so badly in popular public opinion. In the story of Cock Robin the mole dug a grave, but there are few places where the words shrews or bats incite a favorable reaction. Katharina in *The Taming of the Shrew* lacked some of the graces that we think desirable in a woman, and bats are associated either with evil spirits, with Hallowe'en witches, or with screws that are loose in our mental machines. I know of few references to shrews, bats and moles in *The Bible*. In Isaiah 2, 20 we find that man may escape the judgment of the Lord by casting his silver and gold idols "to the moles and to the bats." It is difficult for a naturalist to appreciate the use that might be made of silver and gold by insect-eaters, but the implication is that moles and bats are about the lowest form of life possible. I understand from a friend that there is in the New Testament a kindly reference to bats but to date have been unable to find it. Can you help me?

Of the shrews, again, we find the name applied to an unpleasant woman when we read the proverb: "Every man can tame a shrew but he that hath her." Things are a little more gracious in the proverb that says it is better to be "a shrew than a sheep." Moles fare a little better in folklore. Pope suggests that man "learn from the mole to plow." In an essay on Holy Living by Jeremy Taylor we read that Harcatius, the king of Parthia, was a mole catcher, thus classifying him with other famous persons who filed needles, fiddled and made lanterns. It happens in our modern days that there are not a few college professors who spend some time catching moles and the mole-catcher's role in a golf-links staff is not always wholly unimportant. No doubt the term vamp refers to vampire and vampire bats, and ordinarily we do not recognize vamping as one of the more desirable qualities of the fair sex. On the whole it would seem that bats, moles and shrews have fared poorly in man's opinion.

The Wildlife Conference

EVERY time we attend the sessions of the North American Wildlife Conference — as we did the Seventeenth in Miami, Florida, in March — we come away with a feeling of inspiration, tinged with a sense of frustration. The inspiration comes from having heard, talked with and observed many people devoted to wildlife conservation as a calling and as a cause. The frustration arises from a feeling that we are still talking largely to one another.

The program for the Seventeenth Conference was an excellent one. Nothing could have been more important than presentation and discussion of a policy for the management of the renewable natural resources of the United States. Other subjects extended far beyond the limits of wildlife conservation. Certainly no one failed to take home something of value from the addresses, special meetings and personal discussions.

When the three-day sessions were over, however, we looked back and concluded that the most significant meeting of them all was a so-called technical session considering "Effective Public Relations." And, from our point of view, the most significant talk given — with the possible exception of Izaak Walton League's Bill Voigt's presentation of the natural resource policy — was that by Joseph J. Shomon, educational director of Virginia's Commission of Game and Inland Fisheries.

"The most overwhelming task before conservationists today is proper recognition for the wise use of natural resources *by the masses of the people.*" The italics are ours in the quotations from the statement of this extraordinarily able and perceptive young man, who went on to say: "Scientists are fully aware of our resource status, but *the American people are not.* We conservationists gathered here are familiar with the picture, *but the public is not.* The great and challenging task ahead, then, is adequate information and education with respect to the intelligent care and use of our life-sustaining resources — teaching 150 million Americans basic concepts of conservation and how to live in a wholesome and balanced environment."

Joe Shomon asserted that "no one has come anywhere near sensing the role that education must play in the resource use effort, or in delineating the size of the job that confronts us." He declared that conservationists are not selling their education programs to those who count most — the conservation policy makers, administrators, the professionals. . .Before we can expect the general public to accept conservation as an established social practice we must put our own house in order." This is a task for everyone, he said, for "we all know that wildlife is but a single resource and that the conservation of this resource is inextricably bound with the conservation of all other related resources. We can have no conservation of wildlife by itself. Wildlife is still a land by-product and must be managed on that basis. It is still tied in with land management, ecology, biological relationships."

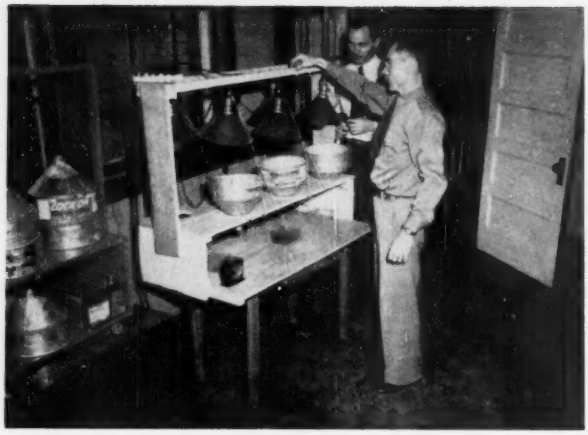
Turning to the subject of the session, the speaker declared that "public relations simply means creating and developing public appreciation for something. . . No program, no business, no agency of government can long survive without the stamp of approval from the people."

Nation-wide, Mr. Shomon found that only four States have conservation education programs well established; ten have made some initial progress; the rest — none. He, a forester trained, pointed to what has been accomplished in that field in arousing public understanding and cooperation. "We wildlife people," he asserted, "are twenty years behind the foresters. . ."

To remedy this situation Mr. Shomon urged a broader viewpoint by wildlife workers; technically trained wildlife information people; bigger budgets for information and education people; use of Pittman-Robertson and Dingell-Johnson funds for resource use education; better coordination of all agencies concerned with resource use; selling the public on resource use education and then calling in the educator to help; achievement of dynamic leadership.

Joe Shomon urged that there can be but one standard of morality — the natural law of the Universe. "Waste must be made abhorrent to everyone; thrift must replace lavishness; frugality must transcend extravagance; honesty must displace dishonesty; common good must overrule selfishness; wise use without waste must be made an accepted social practice; and the laws of Nature must be held inviolate." Mr. Shomon concluded with a paragraph that needs no elaboration or comment. He said:

"Those of us who have chosen to enter the wildlife conservation field are entrusted with grave responsibilities. We have entered this field of endeavor not for self enrichment, but for conscientious public service. Being leaders in the conservation movement to safeguard our life's sustaining resources, we should be ever mindful of two things: first, to set by high professional example a right pattern for living and a respect for our God-given resources; and, secondly, to exhort Americans in all walks of life — *by every conceivable educational medium known to us* — to rededicate themselves to the ways and wisdom of our Founding Fathers — a wisdom which recognized Nature's rightful place in human affairs — a wisdom so beautifully expressed by that great Virginian and third President of the United States, Thomas Jefferson, who said in 1813: 'The spontaneous energies of the earth are a gift of nature, but they require the labor of man to direct their operation. And the question is so to husband this labor as to turn the greatest quantity of this useful action of the earth to his benefit.' "



Birds and A Virus

By T. AIDAN COCKBURN,

Communicable Disease Center, U.S.P.H.S., Atlanta, Georgia,

as told to EVE COCKBURN

Dr. Clarence A. Sooter, ornithologist, and Virgil I. Miles, acarologist, collect mites from birds' nests, which are placed over funnels, lights lowered over them. The mites escape down the funnel to a dish below.

DON'T shoot! Bird lovers, don't shoot! The U. S. Public Health Service's announcement of the discovery of the virus of encephalitis in birds was misinterpreted, in "Contents Noted" (*Nature Magazine*, November, 1951), to be stimulating a vendetta among the fraternity that enjoys shooting. The shooting so far, I am afraid, has been at me — a barrage of letters coming from infuriated Nature lovers and conservationists all over the country. That is why I say: Please hold your fire until you have heard about the facts behind that brief news announcement that started all the furor.

While it is perfectly true that the virus of western equine encephalomyelitis, the complete name for this type of encephalitis, was found in three birds in Colorado last year, I want to emphasize that that announcement gives no reason whatsoever for anyone to shoot or destroy any bird. No one is justified in giving the excuse on the grounds that it might prevent that disease in any man or horse. Such a thing has never been suggested by any reputable scientist, and, as far as I know, it would be repudiated most of all by the people who are doing research on the disease.

You may have heard of equine encephalomyelitis before, or of botulism in horses, or forage poisoning, or, more commonly, sleeping sickness. All these names refer to the same disease, now usually referred to as encephalitis. In the middle West alone it affected 150,000 horses in 1937, the same number in 1938, and substantial numbers in 1941 and 1944. Horses are not the only victims of the disease; in 1941 there were between three and four thousand human cases in the Dakotas and Minnesota. Since the human death rate from the western strain runs between ten and fifteen percent, obviously something must be done about it. The question is, what? As in the case of its better known relative, poliomyelitis, there is, thus far, no specific cure for insect-borne encephalitis. Good care on the advice of the physician or the veterinarian may lessen the effect, but recovery is largely in the lap of the gods. Scientists in various parts of the United States are, therefore, attacking the problem from another angle: How does it spread, where does it come from, and what can be done to prevent it from happening?

To go back a little: In 1930 the virus of equine encephalitis was recovered from the brain of a horse that had died of the disease, and it was later shown that there were two kinds of this virus occurring in the different parts of the country. They were therefore called eastern and western strains. Another kind was discovered in 1933 in St. Louis, when about three thousand people became ill with a new mystery disease, and many died or were left disabled for life. These are the three strains that are prevalent in the United States, although there are many other varieties in other parts of the world.

Although, to begin with, nothing definite was known about the natural history of encephalitis, the people working on it were not completely without clues. Other diseases that were better understood were used as a starting place. Malaria, for instance, had been a scourge for centuries, but it was only in recent times that its transmission began to be understood at all. About fifty years ago Sir Ronald Ross suspected that mosquitoes might carry the malarial parasite and set about to prove it. It was difficult for him to do his work with human volunteers so he let a mosquito feed on a bird that was infected, and after a few days he put the same mosquito on another bird, this one being perfectly well. When that one, too, developed malaria, he had the first real evidence of the part played by mosquitoes in the spread of the malaria parasite from animal to animal. Once the possibility of mosquitoes carrying malaria from one bird to another was proved, the human disease was tackled from this angle. Bird lovers can be proud of the role birds played in the essential research on these diseases with which birds are affected as well as man.

Anyone, who, in summer, has visited ponds or streams among the hungry mosquitoes, knows that they feed on blood. Men must have realized this for centuries without ever realizing that while blood

was being taken out disease might be passed in. The mosquito has salivary juices that will stop blood from clotting, and these are injected before it begins to feed. If there is a parasite or a virus in the salivary juices, it is, of course, passed on to the victim. On the other hand, if it is the man who has the virus or the parasite in his blood, the mosquito sucks them up into its stomach along with the blood. There they develop, multiply, and then move on to the salivary glands to wait until the mosquito takes its next meal. So the cycle goes on, and has been going for thousands of years.

The study of mosquitoes in relation to medicine has led to many new discoveries. First it was found that male mosquitoes feed chiefly on fruit and plant juices, and it is only the female mosquito that looks for blood. It also was discovered that many species will go after anything available when hunger drives, whereas others are more refined in their tastes. These "caviar and champagne" gourmets of the insect world will turn up their proboscises — mosquito for nose — at other kinds of blood and concentrate their energies on finding human blood, or horse blood, or bird blood, whichever is their particular fancy. There are many ways of finding out which kind of blood is preferred by which mosquitoes. One of the crudest, which is effective enough, is for the entomologist himself to act as a human trap, sitting in a car at night with the inside light on. The mosquitoes that come and feed on him presumably prefer human blood, although there is another possibility: They are too hungry to care what they eat, and this man is the only food within smelling distance. A chicken, a horse, or a cow may also serve as the bait, and from countless experiments it is now known which species have a special preference for one animal and which are catholic in their tastes.

Another test, which you often hear mentioned in "whodunits," is the precipitin test. Blood analysis of this kind is used extensively by police laboratories in criminal investigations, and many detective stories feature analyses of blood stains. An expert can take a small sample of blood, perhaps just a stain on a carpet, and tell whether it is from a man, a horse, a cow, or a bird; in the case of mosquitoes, it is the blood inside their stomachs that is analyzed. It is quite a simple and reliable test, which shows roughly whether the mosquito has fed off any of these for its last meal. It cannot show whether the bird was a chicken, a turkey, or an eagle, but that is undoubtedly a refinement that will come with time. When we are able to say that an infected mosquito has fed only on a subspecies of an obscure sparrow, then, of course, our information will be even more helpful, but as it is, the precipitin test tells a good deal in the study of mosquito-borne infections — for example, it shows that *Culex tarsalis* and *Culex pipiens* feed on man, horse, and bird indiscriminately, which is a very important factor in a disease that is common to all three.

With all this in mind, laboratory workers started to look for the encephalitis virus in mosquitoes, and soon

Elizabeth Sims, technician in the Communicable Disease Center virus laboratories at Montgomery, Alabama, withdraws fluid from a fertile egg that has been inoculated with the virus of encephalitis to grow the virus.

found it. Laboratory experiments showed that mosquitoes could transmit the virus from one guinea pig to another, just as Ross's experiments had shown with birds and malaria, so encephalitis now began to look like another mosquito-borne disease. In areas where it occurred, year after year, mosquitoes were collected in large numbers and tested for virus. The results were startling. At certain times of the summer in the affected parts of California, for instance, the sample showed that as many as one in twenty carried the virus, which is a horrifying thought in view of the total numbers around at that time of year. These tests also showed, in the course of time, that some types of mosquito are more likely to have the virus than others, and slowly a general picture began to emerge. The mosquito most frequently found with virus in its body was the same *Culex tarsalis* that feeds on man, horse, or bird, and which can thereby act as a vehicle for spreading the virus from one to the other.

At the same time that all this was going on, another point of attack was discovered. In the late 1930's farmers who were raising pheasants in New Jersey found that a mysterious disease was killing off a large number of their birds. When this epidemic was investigated it was found that the cause of the illness was the virus of eastern equine encephalomyelitis. Pigeon fanciers in the same area had similar trouble, and a substantial number of pigeons was said to have died as a result of the infection. Every year since then, with

only two exceptions, epidemics of the disease have occurred in this New Jersey area, causing considerable losses to the people engaged in rearing pheasants. The owner of a typical flock of a thousand birds suddenly would discover three or four hundred dead or dying.

The next thing must be to discover whether this kind of epidemic occurs only in captive birds, only in this particular species, or whether it is found in any wild birds, in which case another important part of the natural history of encephalitis will be put into place. In 1941 a prairie chicken in North Dakota was found to have the western virus in its blood; but laboratory work showed, in addition, that large numbers of birds had had the disease and recovered. In an area where an epidemic had occurred, as much as fifty percent of the birds had been infected with the virus of encephalitis at some time or other in their lives.

In 1949, the Communicable Disease Center of the U. S. Public Health Service established the Encephalitis Investigations Unit, which has been concentrating its efforts in Colorado. As can be seen, the problem is a very complicated one by now, involving many branches of medicine and zoology. Physicians, veterinarians, entomologists, ornithologists, and mammalogists work alongside the virus laboratory staff, carrying out both the field work and experimental laboratory work necessary for solving the problem. The further they probed into the disease, the more facts came to light to show how deeply involved were many kinds of living creatures. After it seemed to be proved fairly conclusively that mosquitoes were indeed the carriers, the question arose as to how they became infected in the first place. Did they pick up the virus from mammals, from rodents, from birds, or even from the various parasites living on those creatures? During the research many birds' nests were examined and the variety of life found there astonished even the most experienced ornithologist. Bed bugs, mites, lice, and ticks were found by the thousands in every nest. The record was held by a barn swallow, which had many tens of thousands of blood-sucking mites!

It may seem at first that a bird's feathers would form adequate protection against almost any biting insect, but such is not the case. Mosquitoes bite the bare skin around the face and legs, and other parasites burrow down through the feathers until they can draw blood. The baby birds, of course, are completely unprotected prey. Cliff swallows seem particularly prone to ticks, and sometimes as many as twenty can be found on the nestling's head.

Tests were extended until they covered nearly every phase of wildlife. Mammalogists collected small rodents and their parasites; ornithologists drew blood from birds; entomologists collected mosquitoes and other biting insects. Since so many birds showed evidence of having had the disease in the past, it became important to determine at what age they were infected, and as a result nestlings became the next subject for study. Their vulnerability to mosquitoes made it seem as if they might be an important link in the chain, and in addition they are more static than the adults, so that there is no difficulty in obtaining more specimens from them at a later date.

This is a very practical aspect of this kind of research. So, as unwilling as any small boy in the doctor's office, baby birds of all species gave blood samples at regular intervals in an attempt to catch one at the very moment it became infected. The withdrawal of the blood is painless and harmless to the birds.

In Colorado, in 1950, hundreds of nests were visited every five days throughout the nesting season, each nest being given its own code number for future reference. One objective was to find out if at that time there was a large concentration of infected birds in any one area. If that did turn out to be the case, it would be informative to make an intensive study of that patch of prairie, woodland, or marsh, perhaps even pinpointing the focus of infection. So far, that particular line of study has not been worked out, but it is there for the future.

It was from this preliminary general study of nestling birds that the results announced by the U. S. Public Health Service were obtained. Western equine virus was found in the blood of two nestling redwing blackbirds only two weeks old, and in the blood of a three-week-old magpie. About the same time, other workers of the Communicable Disease Center in Louisiana found the eastern strain in a purple grackle, the first time it had been found in a wild bird. Although birds die of the eastern form, the western strain seems to have no visible effect on them. They simply gain immunity against the virus.

Since this is a new lead, plans will have to be modified to take in the new aspect opened up by this discovery. The main thing is to find the permanent reservoir of the disease. Since it is a summer illness only, one problem is where it goes between summers. Perhaps it can stay in the body of the bird, or it may live on in one of the parasites. There is always the possibility that the bird mites themselves are the real villains affecting the young birds in the nest, and, in fact, playing much the same role as typhoid carriers in the human world. Or, of course, it could be the ticks or the lice. It could be anything. Until the reservoir is found, however, nothing can be done to eradicate the disease.

We of the Public Health Service consider this research vital because, if it is successful, it will save human lives. Bird lovers will be particularly interested, not only for the humanitarian goals, but also because a solution to the human disease might also benefit the bird population.

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Friend of Ants

By WELDON D. WOODSON

WIDE WORLD PHOTOGRAPH

Delyn Hornady takes a queen out of an ant colony that has just been dug up. She is placed in a separate contaner, where she will lay eggs.

Most of us think of ants only as pests. It is not so with Delyn Hornaday of Burbank, California. Others devise poisons to destroy them; he works out food formulas to sustain them. He has spent thousands of dollars to keep ants alive.

This role of friend of the ants originated in 1931. As a student in a zoology class at Whittier College, Whittier, California, he crowded, with his fellow classmates, around a tiny fish bowl on a laboratory table. Instead of containing diminutive fishes, however, it housed a hundred or so of ants tunneling into a handful of sand, which the professor had deposited as their improvised home. Hornaday did not see what went on; indeed only students at the table's edge could peer down and witness the behavior of the insects.

This incident set him to thinking. Surely a better method could be arranged whereby teachers could give illustrated lessons on ants and their ways. Why not, he thought, place some sand between two plates of glass? This would provide a cross-section of an ant den. There would need to be a wooden frame to hold this together, as well as an opening or two through which to insert the ants, their food and a medicine dropper of water. In constructing their runways, the ants would bring the grains of sand to the top. This could easily be seen by an entire class as they remained in their seats.

To make it more appealing for children as well as adults, Hornaday carved out a miniature wooden church, school, and road. Between the plates of glass, the lower two-thirds he filled with sand; then placed the replica of a small town. Above this, he left space. Instinctively, the ants transport the sand up to the empty portion — a pinch at a time, day in and day out, until it is full. Watching them do this, picking out the leader, the undertaker, the nurses, the street cleaners, the engineers adds to the thrill of owning an "Ant Village," as they have since become widely known.

Besides the thousands of villages that have gone to schools, hobbyists, Nature students and the curious, many orders have been received from physicians. Watching the insects perform their role in life gets a person's mind off himself. A psychiatrist in Chicago bought 300 villages for his patients. The ant communities have been a boon in the treatment of these; heart trouble, nervous disorders, melancholia and other illnesses also being relieved or sometimes cured.

Movie-goers are familiar with Hornaday's villages. They appeared in Metro-Goldwyn-Mayer's "The Bride Goes Wild," starring Van Johnson and June Allyson; Warner Brothers' "Two Guys from Texas," with Jack Carson and Dennis Morgan; Eagle-Lion's "Hall of Triumph," and Cecil B. De Mille's technicolor "Samson and Delilah." For this latter Hornaday constructed the largest village he ever made, weight 450 pounds. The smallest weighed a mere ten ounces.

From his customers in each of the forty-eight states, as well as foreign countries, this pal of ants has received hundreds of letters of appreciation. An early one from a child addressed him as the "Ant King." She scribbled that since ants have their queens, why should he not be "The King?" Newspapers picked up the story and referred to him as "The Ant King." In time he labelled his business as that. You will find him in the Burbank telephone directory under: "Ant King, The."

A Brooklyn school teacher wrote of the results of the observations of her sixth-grade class. She assigned each pupil to draw a picture of the ant village and write down his or her impressions. The comments were many and varied, but they all stressed the amazing teamwork demonstrated by these creatures. Hornaday believes that getting that lesson, alone, into the

Jack Carson, left, explains to Dennis Morgan the features of an "Ant Village." This is a scene from Warner Brother's "Two Guys from Texas."

minds of children stamps his business venture as worthwhile.

Actually, this ant man conceives of his ants as more than acrobatic entertainers, although the benefits from watching their capers must not be ignored. He contends that if nations would take a tip from the ants and work together, each contributing its bit for the advancement of humanity as a whole, the problems of the world would largely be solved. To Hornaday, the admonition of Solomon is more than an empty phrase: "Go to the ant, thou sluggard; consider her ways, and be wise. . ."

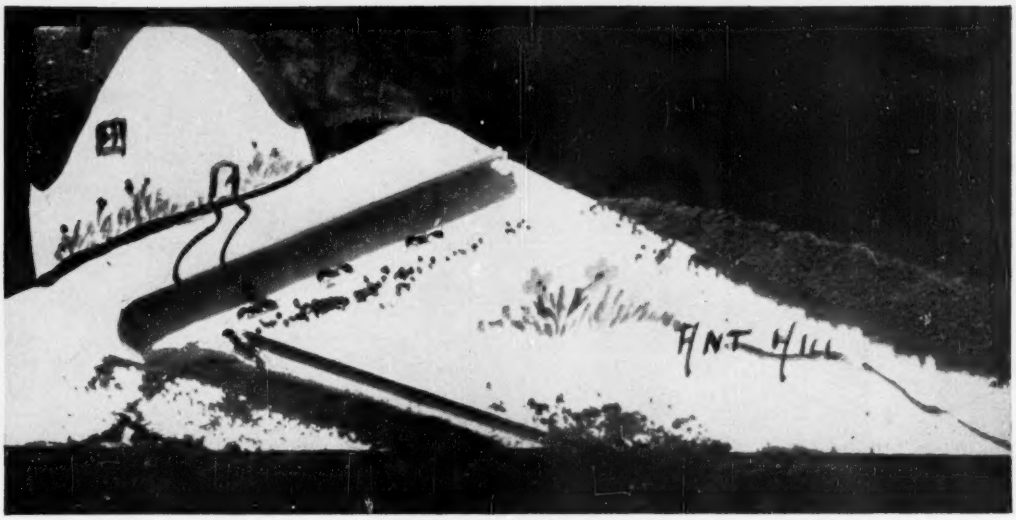
A letter Hornaday prizes came from a dissatisfied woman customer. A child can understand the simple but adequate instructions that go with each village; not so this woman. Instructions explain how to deposit the ants into the upper, or village, part through a hole in the frame. From there, a groove in the wooden replica of a village leads to the sand below. The entrance to the groove has a stopper or sponge, with a wire attached and extending outside of the frame. When one is ready for the ants to work, he yanks the sponge out and the creatures perambulate down, get a particle of sand, thread their way back up the groove, deposit it and hie themselves back down again. The woman inserted the ants into the upper portion per instructions, but, she complained, she had waited two full weeks and the ants still had not pulled out the sponge.

Showing this letter, Hornaday invariably relates an anecdote concerning Edison. Someone asked the inventor which is the most intelligent, ants or man. Without a moment's hesitation, Edison answered that it all depends upon the ant and the man.

One of Hornaday's most unusual adventures occurred when a store in Oakland, California, bought six hundred villages. It ran a half-page ad in a local newspaper. On the afternoon before the sale, the department manager looked the villages over and found them uninhabited. He searched, but failed to locate the containers of ants that accompanied the units. Somehow, they had been misplaced. The man was frantic.

A wire reached Hornaday; "No ants." He examined his stock on hand, but there were only a few. Luckily, he knew of a colony in suburban Los Angeles, but it was raining hard. He nevertheless donned his raincoat, hat and boots, and, grabbing an umbrella, got into his car. An ever-ready pick and shovel, together with pails and other equipment, went on the floor of the back seat and Hornaday was off anting.

Delyn Hornaday with some of his "Ant Villages," which played an important part in the movie, "The Bride Goes Wild."



A glass cage, some sand and several ants busy at their day's work, carrying a grain of sand at a time from the bottom of the village to the pile at the right. They go about their work peacefully, each with a job to do and with perfect teamwork.

By the time Hornaday reached the place, it was growing dark. Notwithstanding, he got out in the rain and dug, faced with the likelihood of having to go to a depth of six or seven feet before he would come upon his quarry. It was the rainy season and the ants had burrowed deep to hibernate.

Unbeknown to the ant man, persons living in the vicinity detected him from their windows and telephoned the police, stating, as he learned later, that a man was digging a grave. Soon a patrol car came to a stop near him, a blinding light flashed into his face, and a gruff voice demanded, "What are you doing?"

"Digging for ants," Hornaday answered in a matter-of-fact manner, as if that were no unusual occupation.

The officers abandoned the murder theory; concluded the man was crazy. "You'll have to come with us," they said.

Hornaday protested, but they were adamant. At the station, he went into detail as to the nature of his mission. Finally convinced, and after apologies, the officers took him back to the colony, and one officer held the flashlight as he finished the job. With ants sufficient to take up residence in six hundred villages, the ant king drove the four hundred miles to Oakland that night and made the delivery.

Among Hornaday's early problems was the fact that the Federal government, as well as the States, have statutes that forbid the shipment of many species of ants. They consider them as objectionable pests and wish to prevent their distribution, even when confined in an ant village and for educational purposes. After lengthy correspondence, he received a permit to harvest and ship the non-pestiferous species, *Pogonomyrmex desertorum*.

There has been much hard work connected with the manufacture of the villages. When first designing them, Hornaday had to determine how much space to allow above for the deposition of the sand. Then, too, ants must have some air. Added to this is their need for a certain humidity, which he provides by means of a bit of sponge soaked in water. The biggest task of all was to learn the best type of food that could be conveniently shipped in a small bottle. He paid an entomologist one thousand dollars for experimentation to determine this menu. This expense was in addition to his own time.

Not any kind of sand will do for the lower section of a village. It must not contain acids or alkalies. To play safe, Hornaday instructs his field men to take the sand from the hill where the ants come from. They sift this through a fine mesh wire. Once he lost $5000 at a single sweep. The project grew so large that he had to depend upon another company to build the frames. In varnishing them, a lacquer was used that killed the ants. Of course it was necessary to replace the villages. Now, a special vegetable paint, not harmful to the insects, is used.

With a smile, Hornaday comments that he must be the largest shipper of livestock in the world. In the eyes of the American Railway Express Agency, that is what ants are. He is required to use a livestock label.

To capture his stock-in-trade, all the ant man needs is a bucket, fish bowl, or any other convenient receptacle, and a spoon. One thing he discovered is that ants can be bagged most easily at dusk. Then they are tired after their day's work. When digging up a colony, Hornaday removes the queen and places her in a separate container, (Continued on page 274)

The haunts of the alpine flowers of the White Mountains of New Hampshire. The Lakes of the Clouds with the Appalachian Mountain Club hut, and surrounding meadows and mountains.

Conquerors of the Cold

By JOSEPH R. SWAIN

Photographs by the Author

ONE August day, many years ago, I climbed the Presidential Ridge in New Hampshire. Then I discovered that even temperate New England displays life zones, so that, by climbing, one travels far to the north, and also into our geologic and botanic past. Thus these peaks, and the headwalls of their adjacent ravines, provide a glimpse of the American sub-Arctic, and of the post-ice age when plant pioneers followed the retreating glaciers.

In books I found descriptions of these plants; but not until I met Stuart K. Harris, biologist at Boston University and once Appalachian Mountain Club hut-master at the Lakes-of-the-Clouds, did I find a teacher who knew the alpines. During two interest-packed days I shared a botanical walk with him up Tuckerman's Ravine, over the Alpine Garden, across Oakes Gulf, and the cliffs of Mt. Monroe, through the boggy meadows at the Lakes-of-the-Clouds, on to Boott's Spur and down the Glen Boulder trail to Pinkham Notch, meeting many alpines in their native haunts. The best guide for the novice is the series of ten annual articles that Harris prepared, from 1940 to 1949, for the June numbers of *Appalachia*, the A.M.C. magazine. A promised reissue as a small pocket volume will make their introductions, keys, drawings and notes available to all interested visitors, and a boon to the botanizing climber.

The regions where these plants grow may be reached quickly over Tuckerman's Ravine trail (if from Pinkham Notch on the east) or up the Ammonoosuc Ravine or Jewell's Path (if from Fabyans on the west). Those who prefer not to climb the ravines may reach the ridge easily via the cog railway from Base Station in Fabyans, or the automobile road from Glen in Pinkham Notch. Then one need only walk the mile or more down the cone on Mt. Washington toward the Alpine Garden or the Lakes-of-the-Clouds to the areas richest in flora.

The titles of Harris' *Appalachia* papers will indicate the feast ahead. I, "Heaths of the Presidential Range" (15 species); II, "The Saxifrage and Rose Families", (16); III, "The Composite Family", (12); IV, "Primrose, Mint, Figwort, Madder, Honeysuckle, and Bluebell Families", (13); V, "Ferns, Fern Allies, and Conifers", (15); VI, "The Rush, Lily and Orchis families", (17); VII, "The Grass Family", (23); VIII, "The Willow and Birch families", (15); IX, "The Buckwheat, Knotwort, Pink, Purslane, Crowfoot, Mustard, Sundew, Wood Sorrel, Violet, Evening Primrose, Parsley, and Dogwood Families, (21); X, "The Sedge Family, (19).

A day's walk may take you through the haunts of all 166 of these plants; but do not expect to meet all in one summer, or ten. But from May through Sep-

Three-toothed cinquefoil is common. It has a woody, upright stem, shiny, three-notched, evergreen-appearing leaves and white flowers.

Roughly, this flora is of two origins — true Arctics, which probably covered the landscape in post-glacial times, and have survived only at cooler altitudes; more recent valley plants, which have been adaptable enough to survive when wind, or birds or other animals have carried their spores or seeds to the heights.

When, therefore, the student enters the forest of the Ammonoosuc Ravine, he may see plants that will accompany him all the way. My most recent journey began on July 3 and at once I noted the large, basal leaves and yellow blossoms of clintonia, *Clintonia borealis*, the small lily which, by late July, will bear indigo-blue fruits. Thus early, the flowers were falling in the valley, but at the foot of the headwall I photographed perfect blossoms, and later, above timber, found tightly closed buds, indicating that by climbing one may recover spring.

tember something will be happening among the alpines. Several heaths, or relatives, such as pale laurel, diapensia, or moss plant will bloom in late June; while such composites as arnica and the goldenrods will not blossom until late July and early August. But any summer month offers reward be-

One of the showiest alpines on the headwall of Tuckerman's Ravine is arnica.

cause, even though blooming be past, there are many fruits often as fascinating as flowers. Nature photographic fans should take cameras with close-up equipment. Written permission is required legally to collect the alpines, as State laws attach heavy penalties for picking them on the mountains.

A few of the more conspicuous valley plants that have spread above timber are: Canada mayflower, *Maianthemum canadense;* bunchberry, *Cornus canadensis;* swamp black currant, *Ribes*

Labrador tea is notable for the woolly linings of its leaves, which have been brewed as tea.

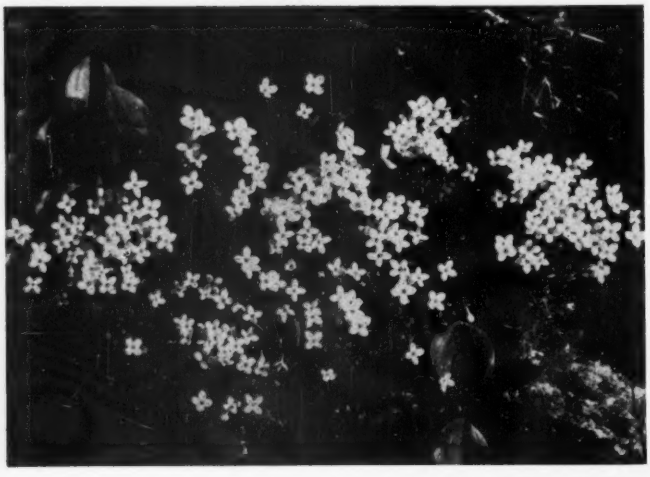
Bunchberry is one of the conspicuous valley plants that have spread to a habitat above timber.

lacustre; northern meadow-sweet, *Spiraea latifolia*, var. *septentrionalis;* American mountain ash, *Pyrus americana;* tall meadow rue, *Thalictrum polygamum;* goldthread, *Coptis trifolia;* common wood sorrel, *Oxalis montana;* star flower, *Trientalis borealis;* the only primrose above timber, self-heal, *Prunella vulgaris*, var. *lanceolata;* the only alpine mint, American white hellebore, *Veratrum viride;* three dwarfed conifers, red spruce, *Picea rubens*, black spruce, *Picea mariana*, with upright cones, and balsam fir, *Abies balsamea*,

Diapensia has conspicuous white flowers above cushions of evergreen foliage.

and several scores of other wanderers.

Travelers over the Ammonoosuc Ravine trail should take the short side trip to The Gorge, marked by a sign. Here the brook cascades in a giant "V" to a roundish pool, where, resting briefly, it falls more hundreds of feet. This day, against a background of spruces, balsam, and birches, two showy heaths, Labrador tea and a magenta azalea brightened the thickets with color, while stations of long beech, *Dryopteris phegopteris*, and common polypody, *Polypodium virginianum*, ferns added laciness to somber ledges,



Alpine bluets gleam like snowflakes against a background of moss. The flower, however, is white with yellow-ringed center.

and clumps of bunchberry punctuated the green with whiteness, while from higher precipices the mountain avens, *Geum peckii*, waved a gusty greeting to the climbing valley flora.

Resuming the main trail, the path climbs steeply through woods until it emerges upon the upper headwall of the ravine, where the stream splashes over open ledges and the bordering forest shrinks to low scrub with an undergrowth of alpines. Here I photographed a large patch of alpine bluets, *Houstonia caerulea*, var. *faxonorum*, gleaming like snowflakes against a background of moss. This "bluet" has

no blue, but is purest white with a yellow ring around the center.

A bit higher, clumps of pale laurel appeared and near them the first sprays of mountain fly honeysuckle, probably *Lonicera caerulea*, var. *calvescens*, its paired yellow flowers, opposite leaves, and general honeysuckle appearance making family identification easy despite its reduced size.

At approximately 5000 feet the trees became scrub, primarily dwarfed forms of red and black spruce with a mixture of balsam, and the pygmy species of alder, willow and birch. The evergreens were showing their fresh green in July; the hardwoods were still in the catkin state. Many of these trees are half a century old, but less than twelve inches tall. Examination of foliage and catkins reveals the characteristics of alders, willows and birches, but determination of varieties takes careful study. I photographed one birch, the round-leaved, *Betula glandulosa*, var. *rotundifolia*. About fifteen inches high, its dainty limbs, twigs, and nearly round leaves with tiny greenish catkins were spread against a gray granite boulder like a dwarf pear flattened against the wall of an English garden. In the coll between Mts. Monroe and Washington I added the dwarf prostrate bearberry willow, *Salix uva-ursi*. Its elliptical deep green leaves shone even in the dull light of an angry sky, and its inch-long, maroon, upright fertile catkins looked ludicrous on a plant hardly eight inches over all and flat as a pancake.

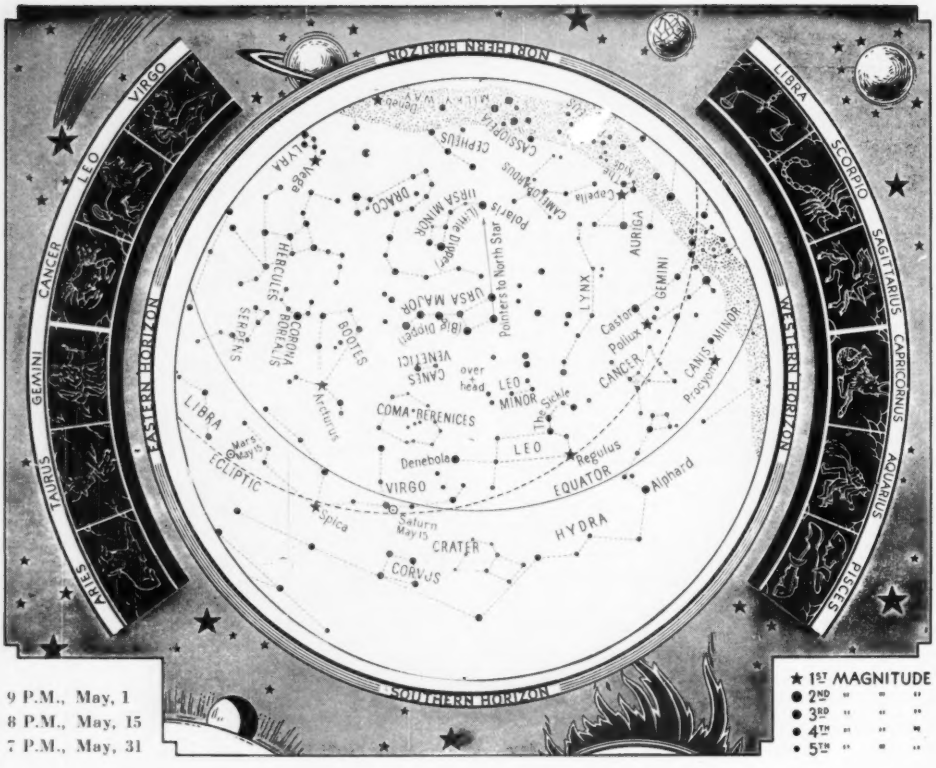
The first sight of the Presidential Ridge is unlike any valley scene. Ankle-to-seldom-knee-high vegetation, with grasses and sedges predominating, covers much of the ground, which otherwise is littered with loose rock varying from chips chiseled off by last winter's frost to huge boulders dumped by the ice many centuries ago. Wind is almost constant, westerlies prevailing. In fair weather banks of cumulus clouds often race through the blue, by intervals lowering their trailing edges like theater drops so that the usual expansive setting of ridge, peaks, and meadows, tied together by the quartz-topped cairns that mark the journeying trails, may suddenly narrow to a tiny closet with you the only actor and the properties a bit of ledge and a colony of alpines. The coll between Mts. Washington and Monroe features the Lakes-of-the-Clouds, two glacial tarns where the Ammonoosuc River, a tributary of the Connecticut, is born. Nearby stands the A.M.C. hut, offering shelter and food to climbers, and on the eastward ridge a wooden cross marks the spot where William Curtiss, a rugged climber, perished in the ice storm of June 30, 1900, a grim reminder of treacherous climate. On such ridges and summits, where winter lasts nine months, and frost, snow and ice may come at any time, in shallow, stony, sterile, highly acid soil, drenched with moisture, at low average temperatures, with seldom an abundance of sunlight and a short growing season, the alpines, and especially the true arctics, make their home.

Many species, included in the plant families represented here, cannot be mentioned, but it is to catch the

Mountain sandwort is a member of the pink family and often grows among rocks bordering trails and in dense tufts.

blooming of the heaths that the botanically minded climber dares early summer weather. Lowlanders will already know such heaths as the rhododendrons, azaleas, laurel, mayflower, checkerberry, blueberries, and cranberry. They thrive in wet, acid, sterile soil. The leaves when evergreen are often thick and leathery, which gives them some advantage in short growing seasons, as the plant can start the food manufacturing processes as soon as temperature, moisture and light permit, without loss of time in first spreading a new growth of leaves.

The regions above timber may thus seem ideal for heaths, but one feature has demanded special adaptation for survival. Many alpine meadows are bogs. But due to the high acidity and generally low temperature of the soil, the plant roots absorb water very slowly. This gives the constantly blowing winds a chance to evaporate much water, which escapes from the little pores or stomata on the undersurface of the leaves before the plants can make use of it. Some of the heaths have made interesting adaptations to keep the rates of water loss and replacement in balance. In one, the Labrador tea, the under side of the leaves has a thick hair mat covering the stomata; while in several others, such as the pale laurel, (Continued on page 276)



To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then, below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. It will not be necessary to turn the map if the direction faced is south.

Venus — A Strange World

By ISABEL M. LEWIS

THE planet Venus has been called the Twin Sister of our own planet, Earth. As to size, mass, density the statement is true. The two planets are more nearly equal in size, surface area, quantity of matter they contain and density of this matter than any other two planets in the solar system. But there the resemblance seems to end, except for the important fact that both planets have appreciable atmospheres. The ability of a planet to hold an atmosphere depends upon its mass, or upon the velocity of escape from its surface, which in turn depends upon the mass of the body. The velocity of escape from the earth is about seven miles per second, that of Venus about six-tenths of a mile less. As the molecules of gas in the atmosphere of a planet are continually flying about at high velocity, which increases with temperature, and continually colliding and rebounding, they tend to escape gradually from the gravitational control of a planet, even though the velocity of the molecules is considerably less than the velocity of escape from the body. So, eventually, even if a body had originally a considerable atmosphere it could lose it. The more massive the body the longer it would retain its atmosphere. Mercury, the Moon, and the minor planets have no atmospheres. Mars, larger than Mercury but smaller than the Earth, has a rare atmosphere. The massive planets — Jupiter, Saturn, Uranus, and Neptune — all have very dense atmospheres.

Although Venus has an atmosphere, its composition, at least that of the upper strata, which can be studied spectroscopically, is very different from that of our own atmosphere. Strong bands of carbon dioxide are visible, indicating the presence of this compound in great abundance in the atmosphere of Venus. The

amount of carbon dioxide in our own atmosphere is very small, as is also the amount of water vapor. At sea level 77 percent of the earth's atmosphere consists of free nitrogen, and 21 percent of free oxygen. Only 3 hundredths of one percent, or 3 parts in 10,000 of the earth's surface atmosphere, consists of carbon dioxide. It is found in volcanic fumes. It is a product of the growth and decay of animal and vegetable life. Why intense bands of this compound should be found in the spectrum of the light reflected from the atmosphere of Venus is one of the unsolved mysteries of that strange world. Carbon dioxide has a heavy blanketing effect upon the surface of a planet in whose atmosphere it occurs. Even the small amount this planet has in its atmosphere appreciably affects its surface temperature. Venus has in its atmosphere thousands of times the amount of carbon dioxide that exists in the earth's atmosphere. It must have a great effect upon the temperature of the surface of Venus.

Venus also receives from the sun, at the upper strata of its atmosphere, twice as much heat and light from the sun as the earth, as the distance of Venus from the sun is a little more than seven-tenths of the mean distance of the earth from the sun. The reflecting power of the atmosphere of Venus is nearly sixty percent, however, which means that sixty percent of the radiations from the sun that strikes its upper atmosphere is reflected from the atmosphere back to space, and the remainder absorbed. Our own planet absorbs about 70 percent of the radiations striking its atmosphere and surface, since its reflecting power, or albedo, as it is called, is only about half that of Venus, or twenty-nine percent. Our own moon, airless and cloudless, absorbs all but about seven percent of the radiations that strike the hemisphere illuminated by the sun. Its albedo is about the same as that of brown rocks. The reflecting power, or albedo, of our own planet is about midway between that of the airless moon and the cloud-enshrouded planet, Venus. What the actual temperature of the surface of Venus is, compared to that of our own planet, depends greatly upon the constitution of its atmosphere, as well as upon its distance from the sun. It has been estimated that the temperature of portions of its surface may be as high as the boiling point of water.

The length of the day on Venus, which has a great effect upon the temperature of different portions of its surface, is not known because the dense and impenetrable veil of clouds that surrounds it never lifts, never shows a rift. No markings have ever been seen on its surface, and it is from observations of markings on the surface that the length of a planet's day is determined. Efforts have been made to penetrate to the surface of the planet by means of photographs taken in infrared light. Not a marking has been recorded on these photographs. Photographs taken in ultraviolet light, which would show markings in the upper atmosphere only, did reveal hazy and transitory markings, evidently atmospheric phenomena that were too indefinite to give any value for the rotation period of the planet.

It is quite certain that the day of Venus cannot equal its period of rotation around the sun, as is the case with Mercury. If it did, the night side of the planet would be so intensely cold that it would show up in measurements of the temperature of the dark side of the planet. Also if the period of rotation were less than about twenty days it could be detected spectroscopically. Although the length of the day on Venus cannot be found directly from observations of markings on its surface, it can be reasonably assumed to be more than twenty days, and considerably less than the 225-day period of revolution around the sun. It is generally assumed to be about a month long, but this cannot be much more than a good guess.

Oxygen and water vapor have not been detected in the atmosphere of Venus, but as only the spectrum of the *outer strata* of the atmosphere is observed the possibility of the existence of both at the surface cannot be ruled out entirely. It is evident, though, from the observations that the constitution of the atmosphere of Venus is very different from that of the earth, and that any life that might exist on Venus would be very different from any forms of life existent on our own planet. No direct sunlight can fall upon the surface of Venus, apparently, for there is never a lift in its dense canopy of clouds.

Inhabitants of Venus, if there were such, would know nothing of the worlds beyond and star-studded night skies. Even the sun, ruler of the destinies of all the planets, remains concealed in a region above of most intense light and heat. It is possible that great volcanic activity is taking place upon this planet. The presence of such great quantities of carbon dioxide in its atmosphere might suggest this as one possibility.

Telescopically Venus is of interest chiefly because, like Mercury, it exhibits all the phases of the moon due to the position of its orbit inside that of the earth. It is not of interest as a telescopic object, otherwise, both because of the high albedo of the planet and its great brilliancy, which makes it difficult to observe visually, and the total lack of any (Continued on page 274)

Sunset and Night

By SALLY MARSHALL WRIGHT

Low in the west
The gong of day
Glimmers dull bronze
In a last soft ray.

Sinking low in the mirrored sea
The sun is a golden wish for me.

A luminous bloom
In the hair of night,
Shimmering petals
Of silver light.

Blooming full in the night so deep
The moon is a dream to steal my sleep.

The School Page

By E. LAURENCE PALMER

Professor of Nature and Science Education, Cornell University, and Director of Nature Education. The American Nature Association

BATS, MOLES AND SHREWS IN SCHOOL

THERE are few schools in which bats, moles or shrews have not at some time made their appearance. If the animals have not come in voluntarily they have been brought in by some youngster. The reaction of the pupils and of the teachers to these animals is probably almost universally unintelligent. The animals are usually considered as undesirable citizens. They are damned by prejudice. They are destroyed in spite of logic. And they demonstrate beautifully how easy it is for reason to be overruled by emotion. Is this not a perfect setting for a profitable educational experience?

As is frequently the case, it is quite probable that in getting a sane reception for these interesting animals the most unreasonable human involved in the problem may be the teacher, who should know better. We cannot, by any magazine article, make a reasonable human being out of one who is not, but we can point out that, possibly, these unreasonable persons are overlooking a good bet when they destroy an invading bat with a broom, praise the cat for bringing in a shrew or express the conviction that all moles are "stick-in-the-muds" and not worthy of a fair trial in a backyard court house before Judge Public Opinion. The special insert in this issue of *Nature Magazine* is designed to provide some introduction to the Insectivora in the hope that a more reasonable understanding than now seems to be indicated may prevail.

Here are a few interesting things about these animals that might be explored in school, should one of them ever pay a visit. The special insert will help elaborate the story. How do these animals know their way around?

Bats form probably the most interesting group in this field. We gave some information on the use they make of sound. We told how they could detect things six feet away by echoes, and when in swift flight could avoid obstructions only a foot away. We did not, in the insert, point out a few interesting things. For example, while bats can, by echoes, detect an object the diameter of a telephone wire they cannot detect a wire with the diameter of a hair. We suggested that they could detect flying insects by echoes, but did not point out how this conclusion was reached. How, for example, would we be sure that the bat did not hear the insect instead of the echo. Dr. Griffin figured this out by noting that the bat increased its cries as it approached its food rather than becoming quiet, as would be the case if it were using sound coming from the insect itself. The bat felt its way around with echoes. This sounds unprobable but it expresses the situation.

The story of how scientists explored this field, finding that bats with eyes covered, or even removed, could fly in safety through mazes, while bats with either their mouths closed or their ears closed were helpless, even though they could see, illustrates the logic used in reaching valid conclusions. Some of these ideas might be experimented with without harming the bat, if a teacher or a child had normal ingenuity. Why should teachers pass up this opportunity if a bat comes into the schoolroom.

It may appeal to some to try a game I tried recently with some students. We mounted a card on top of a camera tripod. We selected a point in a circle around the top of the tripod and gave it a value of 100. On the opposite side of the circle we indicated a value of 0. We gave intermediate values on either side of the 100. Then we blindfolded a student and asked someone to make a sound like the squeak of a mouse. We placed the disc on the tripod so that the 100 value pointed towards it. Then we asked the student to swing a ruler on the tripod so that he thought it pointed towards the sound. The value of his ability to locate sounds gave numbers useful in making scores for competitive groups of students. Then we tried the same thing with one ear of the student stuffed with cotton, and we found that direction could not be so accurately determined with only one hearing unit. Possibly this may be useful in understanding something of the uncanny ability of bats to locate by sound so many things in their environment.

Other worthwhile studies might be made of the seasonal programs followed by bats, shrews and moles, the details of which may be found in the insert. Calendars, or graphs, or illustrations made by the students, or cut from magazines, may be used for exhibit purposes to help inform visitors to the school about these matters.

The tabular material in the insert is of such a nature that it should provide useful material for preparing reports of the physical description, range, reproduction, ecology and economy of the animals. If one student, or one group of students, assumed responsibility for each of these interesting areas, the pooled reports would do much to improve an understanding of these mammal friends.

Many schools make a practice of trying to keep wildlife captive, supposedly for observation. This may be simple for such animals as goldfish, turtles, frogs and some snakes. Even mice, hamsters and guinea pigs may not be too difficult. When it comes to caring for the moles, shrews and bats the task is not an easy one. We can easily buy food for goldfish and mice, but what do we do with an animal that eats its weight in insects in a relatively short time. Fortunately the tabular material shows how a substitute mixture may be used, presumably for almost any of this group. If this leads to the slow starvation of some little mammal we are sorry, but if it leads to its survival and eventual freedom, then we are pleased.

For those who are interested in social sciences these creatures offer interesting studies. How they manage to get along with each other, or how they resent too close association with others of their kind, their relatives or of the other different sex makes many an interesting story. The reasons for these differences are backed by logic based on biologic necessity, or may be difficult to determine. How these compatibilities vary through the seasons and with the different age groups, and how these may be associated with available food supply for animals whose demands are exacting, may interest some students who may express their interests in writing, or even by private investigation.

There are, of course, interesting physiological problems associated with a group, some of which migrate while others hibernate. There is reason back of the fact that those animals that feed underground, where food is available through the year, should not need to hibernate or migrate as do those animals who must face a food supply that fluctuates remarkably. Then there is the almost unique delayed conception that led to confusion as to the length of time for gestation. Here we might find a basis for a rational discussion of some phases of sex education important in a well-rounded school program.

Teachers of physics will find the subjects of this insert providing a medium for the study of supersonic sounds, echoes, and the like. Chemists may be intrigued by the scents associated with the shrews, and also by the poison secreted by some shrews. This is reported to have some of the properties of cobra venom.

There are always those whose interests lie outside the field of science. To these the group should still be interesting because there are so many sayings about molehills, bats in belfrys and shrewish behavior that should be suggestive to the English teacher. And while it may be fun just to collect the local convictions and prejudices, it may be well to find out what can be done about them.

Bulletins

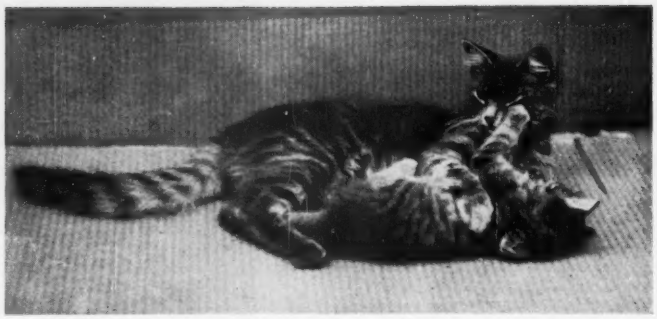
Four new bulletins have been received from the Public Health Service, Division of Water Pollution Control, Federal Security Agency, in the series based upon cooperative studies of drainage basins. These are reports of water pollution conditions in the basins, with programs for improvement. The latest reports to come to hand are #9, Colorado River Drainage Basin; #10, North Atlantic Drainage Basin; #11, Lake Erie Drainage Basin; #12, Ohio River Drainage Basin. . ."Persecution of Freedom?" by Irston R. Barnes is a reprint of a discussion of the bald eagle. National Audubon Society, 1000 5th Avenue, New York 28, N.Y., ten cents . . . "Native Bees" is the title of four more bulletins by O. A. Stevens, published by the North Dakota Agricultural Experiment Station. . ."Gravity Shapes and Controls the Universe" by Junius T. Hanchett, the Whitton Book Company, Antrim, N.H., forty cents. . ."The Story of Island Beach" by John K. Terres. A bulletin of the National Audubon Society, 1000 5th Avenue, New York 28, N.Y., describing this last remnant of unspoiled New Jersey coast, which conservationists are attempting to save for posterity. Ten cents.

Trail Merchants

Once again this year Frank and Edna Evans are conducting their Wilderness Trail Trips in Glacier National Park. There will be four ten-day trips, starting with one on July 7 and ending with one that gets under way on August 18. Other starting dates from Belton, Montana, are July 21 and August 4. These trips are afoot but not planned as a strenuous endeavor. Pack animals carry the food and equipment, so the hiker moves unencumbered on trails that are laid out on grades kind to the hiker. Full details are available from H. Frank Evans at 715 W. Garden, Coeur d'Alene, Idaho, until June 1, after that date from him at Panorama Ranch, West Glacier, Montana.

Camera Trails

By
EDNA HOFFMAN EVANS



This family tussle picture was largely the result of luck, as are many cat pictures.

SINCE last month's "Camera Trails" section was concerned with dog photography, it seems only logical to devote a major portion of the present section to that other handy domestic model, the cat.

I, personally, think cats are much more difficult to photograph than dogs. Perhaps this is because I like dogs better than cats and feel more at ease with them. Perhaps dogs are more cooperative than cats. Certainly, dogs are better pals than cats. When a dog likes you, he wants to please you and be with you. Change clothes, put on your coat, get ready to go out and the unspoken question in a dog's eyes is "Please, may I go with you?" A cat, on the other hand, merely looks at you in a disinterested sort of way and the expression in the eyes says "Going out? Well, see that you get back in time to feed me."

A dog will pose consciously — and conscientiously. Tell him to "sit," and he will. Tell him to stand, and he does that, too. Many dogs will stay in place indefinitely, until permission is given them to move.

A cat rarely obeys in the same manner that a dog does. A cat is its own boss. It does as it pleases. However, almost any position a cat assumes is an unconscious pose. The difficulty comes in having the photographic equipment ready to take advantage of the desired pose when it happens.

In only one instance, I think, does a cat prove more amenable than a dog. That is under the floodlights. Many dogs are not happy for long when photofloods are glaring at them from two or three different directions. A cat, perversely enough, usually likes the bright lights and tends to doze off comfortably under the heat from them. Of course, among both dogs and cats there are exceptions to this generalization.

Cats move much more and much faster than dogs. In fact, cats are rarely ever completely still unless they are asleep. Thus, cat pictures must be taken with shutter speeds much faster than the ones usually used for dog pictures.

Since they are not so much inclined to "stay put," cats present another photographic difficulty. Either they must be put in a place from which they cannot escape (pretty hard to do with a cat), or they must be photographed in surroundings congenial enough to make them want to stay of their own accord.

It was by the latter of the above mentioned methods that I obtained the picture of the friendly wrestling match between the mother cat and her nearly grown daughter. The background, I readily admit, leaves much to be desired. I could pretend, of course, that they were at home in a packing case in some alley. But such was not the case.

Instead, I gently persuaded them that the strip of cardboard on the ground in the back yard was a nice place to play. After that it was a fairly simple matter to slip a similar piece of cardboard behind them to serve both as a background and as a screen to shut out distracting objects. Desirable or not, I was quite happy to be able to ease it into place without frightening my two models away.

The picture was taken from a very low angle. The camera was held close to the ground and about six or eight feet from the subjects. My shutter speed was 1/100 and my lens stop was f/8. The day was one of those bright but cloudy ones so there were no intense shadows. The shutter speed, I will admit, is a rather slow one for rapid action. Cat tussels, on the other hand, can be very speedy. Fortunately for me, however, the two participants were in a lazy, unhurried mood. Thus, no unexpected moves occurred to spoil my picture.

The family tussle picture was largely a result of luck, as are many cat pictures. I could not have done any more to stage it if I had wanted to.

The white whiskers portrait, on the other hand, is the result of long and patient stalking. The cat belonged to a neighbor, and for a long time the photographic possibilities of its spectacular whiskers and white, Hitler-style "mustache" had interested me. This was not the first time I had tried for a whiskers picture.

Flash pictures of cats are usually rather successful. But the black pussy had steadfastly refused to cooperate and all I had to show for my efforts was a collection of burned out flash bulbs and some exposed but useless film.

Finally one summer morning I just decided to follow Mr. Puss until he consented to pose for me. We wandered all around his own back yard and then over into another neighbor's yard. Time and again he paused tantalizingly, but he always moved on again before I had time to get set for a picture.

Up the neighbor's back steps he wandered, stopping now and then for a stretch, a sniff, or a curious glance in my direction. At last he reached the porch floor. The closed screen door was ahead of him and I was behind. So, philosophically, Puss sat down. He stared thoughtfully at the door for a few minutes and that gave me time to get set. When he finally turned a curious glance over his shoulder at me, I was ready. His portrait, I think, is a good one. The light area of the screen in back of him serves as a frame for his head. And, light as it is, the screen is still dark enough to give contrast to his white whiskers.

The picture, as it is reproduced here, is only a small part of the entire negative. Note that the focus is on the eyes, as it should be in animal pictures. Since there is less depth (distance from nose-tip to ears) in a cat's face than there is in the faces of most dogs, the problem of getting all the face in focus is not so difficult. I might also add that this is not the only

This white whiskers portrait is the result of long and patient stalking.

Even though it does herald the arrival of spring, this picture is jumbled, confusing and disappointing.

picture I took of Mr. Puss that day. By taking several I could pick the best and thus be much more certain of at least one usable picture.

There are several points that the photographer should remember when he goes in search of cat pictures.

First, patience is important; do not get disgusted and give up if your model refuses to cooperate as you think it should. Second, be ready at all times to take advantage of an unexpected pose that offers photographic possibilities. Third, use a fast enough shutter speed — 1/100, 1/200, or even faster — in order to stop rapid movements. Fourth, use backgrounds that set off and give contrast to the tones and textures of fur. Fifth, watch for unusual angles — get down to the cat's level, or even below it — since cats are climbers, they appear much more natural when looking down at the camera than a dog would in a similar pose. Sixth, try for different eye expressions. The various degrees of pupil dilation make a cat's eyes highly expressive.

Cats make interesting models and pictures of them are attractive and appealing. The photographer who takes a good cat portrait has something he can honestly gloat over and be proud of.

SIGNS OF SPRING

SPRING is here again, even in the cooler, more northerly climes. And, whenever spring arrives, it presents dozens of enticements and challenges for the person with a camera.

There are always the first sprigs of green, the first wild flower, the first bird's nest, and even the first newly-hatched nestlings. Some are more photogenic than others. Some grow in places more readily adaptable to photography than others.

I was looking for a "signs of spring" photograph not long ago and I found the picture that appears here. It is a mixture of fern leaves and shoots of a southwestern parasitic plant called broom-rape, *Orobanchaceae*, all bedded down in a blanket of last fall's leaves.

The day was partly cloudy and the light was rather dim for it was filtered through a ceiling of oak branches high overhead. The soft browns and greens of the leaves and ferns made a pleasant picture, with the pale yellow of the broom-rape spikes providing contrast. I was much pleased with the photographic possibilities when I took the picture. The results, however, are somewhat disappointing. The picture is crowded, jumbled, confused.

In color it would be much better, I think. In black-and-white it lacks something. There are too many details and too little simplicity. None the less, it is good to know that spring is here again and that there will be more and more picture possibilities every day.

PHOTOGRAPHY DATA

SOME people do not like the way a darkroom smells, especially when the smell is that of acetic acid. For the possessors of sensitive noses, Du Pont has introduced a new 18-F Universal Fixer to replace the old, smelly acid hypo solutions. The chemical that does the trick is an aromatic, oil of lavender derivitive that masks out the acetic acid and sulphite odors. Because of its pleasant smell the fixer is desirable for home use and in commercial darkrooms where the unpleasant old-style aroma may not be too welcome. The new product is a single-powder hardening fixer for all types of photographic films and papers.

Also for darkroom use is Craig Foto-

fade, a dye chemical that permits the addition of professional effects such as fades, wipes, and the like to home movies. Fotofade can be used on new or old film, black-and-white or color. No expensive camera attachments are required. The fades and wipes are made after editing. Home movie enthusiasts who are interested should write for the free Craig booklet, "Tips and Tricks on Movie Editing." The address is Craig, Inc., Plainville, Conn.

Eastman has doubled the shutter speed of its Kodak Tourist camera, increasing the top speed possible from 1/100 to 1/200. The other speeds possible with the new shutter are 1/25, 1/50, and 1/100, plus bulb. Despite the change in shutter, the Tourist camera will still retail for $46.25, federal tax included.

A new type color film — Kodak Ektachrome roll film, type B — was recently made available for photographers who wish to process their own film. Type B, a companion to the Ektachrome roll film, daylight type, which has been available for several years, is intended for indoor use under artificial lights. It is available in 8-exposure rolls, sizes 620 and 120.

Ansco has issued a new film size, Ansco 828 roll film, in both black-and-white and color. Each roll will yield eight 28mm x 40mm pictures. This size, as you can tell, is slightly different in dimension than the usual 35 mm (square) miniature size film.

For people interested in films and up-to-date photographic procedures and data, the Du Pont booklet, "Photographic Films," should prove informative reading. Available at most photographic stores, the booklet sells for 35 cents.

LISTENERS TO THE WILD

(Continued from page 248)

they are doing!" We had a good many problems, the greatest of which was to break down their terrific persecution complexes. As I have said, life had dealt those girls a dirty deal; one so dirty that they were convinced that there was nothing left except dirt and malice, and what bare sensual pleasure that might be gleaned along the way. Mostly they came from the slums; mostly they did not want anything except to be left alone. What was there to be done with and for such as these? They wanted no organized program of badges and first-aid and homemaking. They did not know what to do with such projects and cared less. But it was essential to make them want these things; and do it with no money.

We found our answer quite by accident. A friend of my assistant leader had a cabin in the mountains. We could take the girls there. They were not very enthusiastic about the trip when it was suggested. But when we mentioned that the Sea Scouts were driving the cars, their interest immediately picked up. They were nice fellows, too, older than the girls, and the boys kidded, joked and helped us make camp. Their scoutmaster, or whatever they call the head man in the Sea Scouts — Skipper, I guess it is — was a naturalist under whom I had studied my pre-medical zoology. He knew how to show kids things without seeming academic, and before that weekend trip was over, he had those girls so interested in the forest life around them that they clamored for his help in finding and classifying the flowers and animals they saw.

It was a wonderful thing to hear the difference in their voices. Several of the girls became interested in bird calls, and here I could help them, as my sharpened sense of hearing made this sort of identification easier for me than for most sighted people.

We listened and looked and told each other of Nature for nine weekends, sometimes with the Sea Scouts along, and sometimes without them. No longer were my girls sullen, resentful animals anxious to get away from my clutches. Some of them photographed what they saw, or made pictures with brushes and with pencils. Some found songs to sing from their own hearts. But most of them were just ordinary eager creatures who, for the first time in their lives, had come to understand that Nature is both cruel and kind; that love and harmony can exist; that Nature has laws that must be obeyed if the balance of things is not to be broken. They learned the give and take of it all, the good and the bad, the beauty and the ugliness that can blend into an over-all oneness of which each creature is a part. These are the things we must blend into a security for our children. They are not an escape from the world of reality; they are the reality itself. For we can take into our lives beauty and harmony and laws of good and bad, of extreme and balance. Each has its place. If we would only listen more often to the wild, we would find that here is our picture of the universe — our faith and security that life is worth living.

FRIEND OF ANTS

(Continued from page 263)

where she lays eggs.

In reflecting over the career that he has chosen, Delyn Hornaday likes to think of his cousin, the late William Temple Hornaday, who as chief taxidermist for the United States National Museum and director of the New York Zoological Park, as well as through his many books, promoted game preserves and laws for the protection of wildlife. W. T. Hornaday fought for the rights of the larger animals; Delyn Hornaday, just as zealously, champions the cause of ants.

VENUS — A STRANGE WORLD

(Continued from page 269)

interesting features such as occur in great variety on the surface of Mars and Jupiter.

The brilliancy of Venus is so great that it can be seen easily in broad daylight under favorable conditions if one knows approximately where to look for it. No planet even approaches Venus in splendor in the night sky. When farthest east of the sun it may set as much as 4½ hours after the sun and when farthest west of the sun in the morning sky it may rise 4½ hours earlier than the sun. Although the planet takes 225 days to make one trip around the sun, it takes a year and seven months to pass from superior conjunction with the sun, when it is in line with earth and sun with the sun between the earth and Venus, back to the same position in its orbit relative to the earth. Its distance from the earth is then 67,000,000 miles (distance of Venus from the sun) plus 93,000,000 miles (distance of the earth from the sun), which is 160,000,000 miles. At inferior conjunction, when the planet is again in line with earth and sun but now between them, its distance from the earth is the difference of these two distances, or 26,000,000 miles. Venus is then nearer to the earth than any other body in the heavens, except the moon and an occasional asteroid or comet. Greatest eastern elongation of Venus occurs when the planet is farthest east of the sun in the evening sky. This occurs about 72 days before inferior conjunction, and 220 days after superior conjunction with the sun. About 36 days *before* inferior conjunction it has its greatest brilliancy in the evening sky. It is then about six times as bright as Jupiter. Thirty-six days *after* inferior conjunction Venus has its greatest brilliancy in the morning sky, and 72 days after inferior conjunction is at greatest western elongation in the morning sky. It then takes 220 days to reach superior conjunction once more. It is interesting to follow Venus during this entire cycle of change in position relative to the earth. At conjunctions it is invisible, too close to the sun to be seen. At the present time Venus has the phase of the gibbous moon when viewed telescopically, but it is too low in the morning sky to be easily observed. It was farthest west of the sun last November, and in June will be in superior conjunction with the sun, when it will have the phase of the full moon but will be too close to the sun to be seen. Then it passes into the evening sky, but will be too near the sun to be seen for some weeks.

Mars will be nearest the earth on May 8, at a distance of about 51,860,000 miles. It will be at greatest brilliancy this month in Virgo, and visible nearly all night. Jupiter is now in the morning sky rising about an hour before sunrise. Saturn is in Virgo, to the west of Spica and visible most of the night.

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CONQUERORS OF THE COLD

(Continued from page 267)

the edges of the leaves are rolled in over the under surface so that the drying winds are partly baffled.

All of the alpine heaths of New Hampshire are shrubs, plants with woody stems that live from season to season, rather than herbs that grow each spring from roots or seeds. As a group heaths are low, varying from prostrates like Lapland rose bay to the erect Labrador tea, which may exceed a foot in height. Heath leaves are often evergreen, mostly long, narrow, and usually toothed, although there are numerous exceptions. The flowers are generally tubular, the petals being the bent-over ends of the tube. In size they range from the crowberry's tiny blossoms, lacking petals altogether, to the Labrador tea and pale laurel, which may reach half an inch across. Colors vary from white to rose to violet and pale purple. The fruit is often a berry, such as cranberry and blueberry, but may be a pod or capsule as in Labrador tea. Several, such as the blueberry, billiberry, and cranberry are edible; and I know only one plant, pale laurel, to be poisonous to man or beast.

Harris lists fifteen heaths and heathlike plants found on the Presidential Range. These are crowberry, *Empetrum nigrum*, distinguished by a tiny flower and black berry; Labrador tea, *Ledum groenlandicum*, found also at lower altitudes and notable for the woolly linings of its leaves, which have been brewed as tea; rhodora, *Rhododendron canadense*, deciduous, and flushing the spring bogs with purple; Lapland rose bay, *Rhododendron lapponicum*, prostrate, with violet-purple bell-shaped flowers; alpine azalea, *Loiseleuria procumbens*, low and mosslike, with white to rose colored bell-like blossoms; pale laurel, *Kalmia polifolia*, somewhat like lowland sheep laurel, flowers typical laurel saucers, lilac to rose purple; mountain heath, *Phyllodoce coerulea*, somewhat moss-like, flowers small, purplish and nodding; moss plant, *Cassiope hypnoides*, often mistaken for a moss when not wearing its dainty, nodding white blooms; alpine bearberry, *Arctostaphylos alpina*, leaves not evergreen, toothed, and wrinkled, fruit a black berry; low sweet blueberry, *Vaccinium pennsylvranicum*, var. *augustifolium*; bog billberry, *Vaccinium uliginosum*, var. *alpinum*, much like the blueberry, leaves broad and toothless; dwarf billberry, *Vaccinium caespitosum*, toothed leaves, flowers and fruit borne singly; mountain cranberry, *Vaccinium vitis-idaea*, var. *minus*, matted low foliage, tiny pink blossoms and bright red berries, excellent for jelly; wren's egg cranberry, *Vaccinium ozycoccus*, a miniature of the trailing, cultivated cranberry with nodding, shooting-star-like flowers, unripe berries being spotted like some birds' eggs; and diapensia, *Diapensia lapponica*, a heath relative, with conspicuous white flowers waving above bright green cushions of evergreen foliage.

If the ascent is planned for the more popular climbing season of mid-summer, the showiest botanical reward will be the composites, which bloom from middle July to killing frost in September. Wild flower lovers know the family characteristics, the great difference being in flower structure. A daisy or black-eyed-susan looks like a single flower, but is really a bouquet. The petal-like ray flowers form the outer ring, while the disk flowers make up the round center. The structure that holds both sorts of flowers is known as the receptacle. The cup, or involucre, made up of many scale-like involucral bracts, surrounds the flowers. Dissection will quickly reveal these parts.

If the route be through Tuckerman's Ravine in late July or early August, snow will have nearly vanished. On the headwall the springtime "fall of a thousand streams" will have become the trickle of a dozen. The valley flora will accompany the hiker much of the way from Pinkham Notch Shelter to Hermit Lake. Many of the flowers will be the composites such as large-leaved goldenrod, pearly everlasting, and tall rattlesnake root or wild lettuce. Some, or their relatives, will continue to the heights.

However, even toward the lower ledges of the headwall, representatives of other plant families will be found in flower. Belated marsh violets, *Viola palustris*, may lift their pale lilac faces between the rocks; remnants of alpine bluets and avens may still toss in the wind. Fireweed, *Epilobium augustifolium*, will border the trail; and on headwall terraces the candle-like blooms of the tall leafy white orchid, *Habernaria dilatata*, will be found, a stray from its lowland habitats, and many others. But the "flower show" of mid-summer will be primarily composites.

On the headwall the showiest will be arnica, *Arnica mollis*, with its attendant, smaller-headed variety, *petiolaris*. The flowers of the species, both ray and disk, are brilliant yellow and sometimes two inches across. The whole plant may exceed two feet, and is related to the English arnicas from the roots of which the familiar liniment is extracted.

Other composites that venture above the trees include the genus *Solidago*, the goldenrods. Mercifully there are only three. The stoutest is the large-leaved, *S. macrophylla*, var. *thyrsoidea*. The species climbs well into the ravine; higher the variety may be distinguished by its still large leaves and cup-shaped flowering heads. The second, Rand's, *S. randii*, is also fairly tall, the stems tinged often with purple and the yellow flowers arranged in a sort of cylindrical head. My favorite is the alpine goldenrod, *S. cutleri*, the smallest of the genus, usually under ten inches and often prostrate, with fewer than five thick leaves.

Asters also follow the climber all the way, and the two alpine forms will appear on the ravine headwalls. The species are the leafy, *Aster foliaceus*, and the purple-stemmed, *Aster punicens*, var. *oligoncephalus*. Both have blue to purple ray flowers with yellow disk, the leafy being more common, smooth, and more slightly built; while the purple-stemmed may be distinguished by the madder purple of the lower stem, its stouter build, and generally rougher hairier aspect.

The pearly everlasting, or straw flower, found above timber is usually *Anaphalis margaritacea*, the main species, rather than the woolly variety, *revoluta*, common in lowland meadows. As in all everlastings, the florets are less conspicuous than the involucral bracts that surround them like the opening petals of a water lily. Similar also to its lowland species is the one yarrow, *Achillea millefolium*, var. *nigrescens*, which climbs the headwalls, but, as the name suggests, its bracts are darker. When without its tiny white florets, the fernlike leaves, unlike other composites or alpines, identify it.

The one relative of the famous Swiss edelweiss found in the White Mountains is the small mountain cudweed, *Gnaphalium supinum*; related also to the everlastings. So inconspicuous is this woolly, tiny-flowered arctic with narrow, linear, basal leaves that it must be sought among taller things on the tundra; but it should be distinguished from the very different and abundant sandwort, which so many climbers wrongly call edelweiss. Sandwort, *Arenaria groenlandica*, is a member of the pink family and grows often among rocks bordering trails, in dense tufts from which its linear, threadlike leaves spring. Its small, numerous, translucent white flowers toss in the wind on most New Hampshire summits from June to August.

Three rattlesnake-roots dwell above timber, these being the low, *Prenanthes nana*; tall, *Prenanthes altissima*; Boott's, *Prenanthes bootii*. They differ from other alpine composites in having only ray flowers, and all have a confusion of varied leaf shapes, usually three-parted and deeply cut, but also heart-shaped, and in other forms. The tall, familiar also in the lowlands, is smooth, with dull cream-colored flowers born in small clusters. The low has greenish heads; and Boott's, the most dwarfed, has, nonetheless, the largest flowering heads, whitish, fragrant, and enclosed in a dull magenta-tinged envelope.

Mention may be made of only two members of the rose family. One, the dwarf cinquefoil, *Potentilla robbinsiana*, the rarest plant of the range, is unique to one small area on Mt. Washington and another on the Franconia Range. A tiny, but characteristic cinquefoil, its yellow blooms are usually gone before July 1. The other, the three-toothed cinquefoil, *Potentilla tridentata*, with upright, woody stem and shiny, three-notched evergreen-appearing leaves and white flowers, is common. The bluebell, *Campanula rotundifolia*, whose single flowers toss on slender,

low stems in the incessant gales, also brightens the high ravine walls in midsummer.

Space forbirds mention of many other alpines, including several large and interesting families such as the rushes, grasses, sedges, ferns, and their allies, and others.

I can only trust that our time together may have whetted the reader's appetite to search out for himself the New Hampshire alpines, whose forebears centuries ago patiently reclothed the earth in green in the wake of the vanishing ice, helped to create and enrich our soils, continue to make interesting and inspirational our heights, and are certainly among the "Conquerors of the Cold."

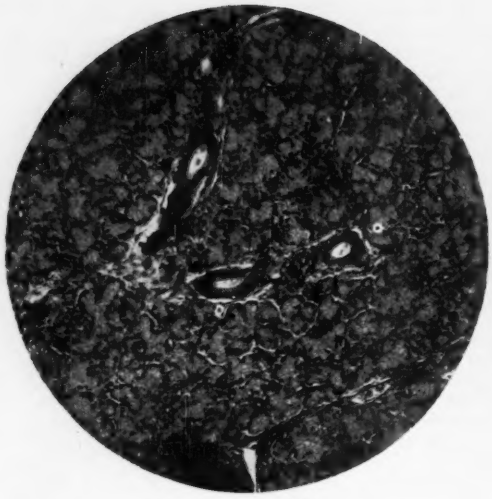
ANSWERS TO HUMAN INVENTIONS VERSUS ANIMAL ATTAINMENTS

1. K. Honey bees. During warm weather, groups of honey bees take up a position near the entrance to the hive and keep their wings vibrating continuously. This causes the air to circulate. This circulation plus the resulting evaporation from the nectar within, keeps the hive cool and causes an even temperature to be maintained.
2. L. Spider wasp. The spider wasp overcomes spiders by injecting a substance into their victims with a stinger. The wasp then places the spiders in a nest and lays an egg among them. The injected material preserves or embalms the spiders so that when the egg hatches some time later, the young wasp has a fresh food supply.
3. J. Armadillo. This creature is covered with hard, bony plates from its head to the end of the tail. Some species can roll the body into a round ball, which makes them hard nuts to crack.
4. F. Rattlesnake. The poison fangs of a rattlesnake are hollow. When the reptile bites, muscles squeeze the poison glands and force the venom out through the fangs into the victim.
5. G. Skunk. If you did not get this answer you have never contacted an irate skunk!
6. H. Squid. The squid moves rapidly by taking water into a space within the body, then strongly contracting the walls of the chamber. This squirts the water from an opening and the squid is propelled in the opposite direction.
7. I. Water beetle. Some water beetles entrap air under their bodies with a film of water. They breathe this air and this allows them to remain under water for long periods.
8. C. Bat. As bats fly, they continuously emit cries that they can hear, but which are inaudible to human ears. The echoes of these cries striking obstructions are received by the bats, and this allows them to avoid obstacles, even in total darkness.
9. D. Ground beetle. When disturbed, certain kinds of these beetles emit a small amount of gas, which is expelled with an aubible popping sound. They are called bombardier beetles.
10. E. Flying squirrel. The flying squirrel actually glides rather than flies. This it does by leaping into the air and spreading loose folds of skin, which occur between its front and hind legs.
11. M. Torpedo. The torpedo is a kind of fish that generates a powerful electric shock. This it uses for protection and for obtaining food by shocking other fish into submission.
12. N. Lightning bug. This well-known beetle has a light in its tail, which it flashes on and off as it flies at dusk.
13. B. Flounder. Some of these fish can blend so perfectly with their surroundings that one could almost play checkers on one if it were placed on a checkerboard background!
14. A. Young spiders. Many young spiders climb blades of grass and spin balls of silk. If these are caught by the wind, the youngsters are carried through the air for long distances.
15. O. Angler fish. These are deep-sea fish that feed on other fish. They have projections about the mouth resembling worms, which attract their victims within reach.
16. Q. Pronghorn antelope. These animals have a patch of white hair on their rumps. These are erected when the creatures are disturbed. The reflection from this "heliograph" warns other antelopes of possible danger.
17. R. Green tree ants. The young or grubs of these ants spin silk, and this silk is used in the construction of the nests, which are made of leaves. Some worker ants hold the edges of two leaves together, while other workers take grubs and apply them to the edges. Dutifully the grubs spin their silk and this binds the leaves together.
18. S. Arctic hare. This animal is also, appropriately, called the snowshoe hare or rabbit. The feet are large and the soles are covered with a thick layer of hair that prevents slipping, and which allows the hare to run rapidly over the surface of the snow.
19. P. Elephant. The elephant fills its trunk with water and sprays it over the body. One has also been known to squirt a trunkful of water full in the faces of annoying human beings.
20. T. Butterflies. These insects obtain nectar from within flowers with their long tongue. This structure, which is hollow, makes an efficient soda straw.

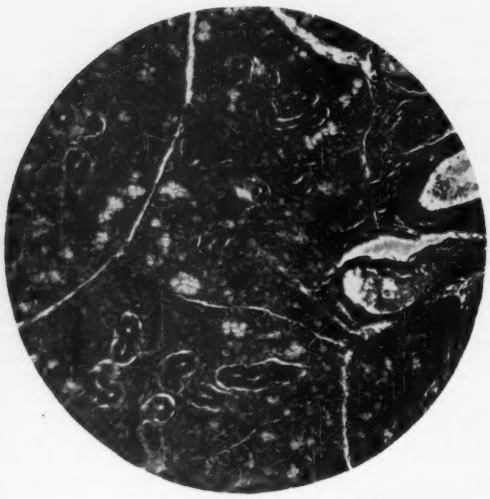
The Earth

The Strange Story of Our Earth. By A. Hyatt Verrill. Boston. 1952. L. C. Page and Company. 255 pages. Illustrated. $3.75.

This is the story of the growth of the planet Earth as revealed by the sciences of geology and paleontology.



Parotid, dog, 150X.



Submandibular, 150X.

UNDER THE MICROSCOPE

By JULIAN D. CORRINGTON

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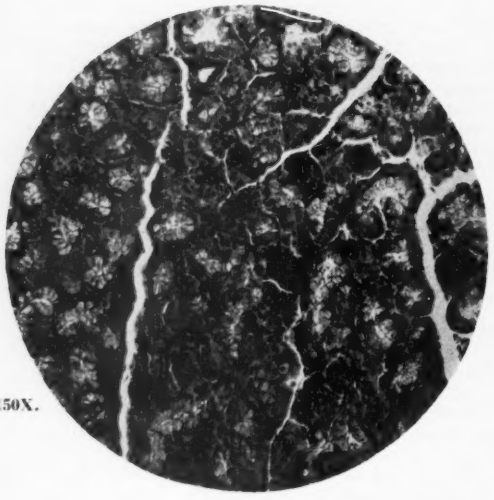

Sublingual, 150X.

HUMOR, TEMPERAMENT, AND SALIVA

DID YOU arise in a good humor this morning? Or were you melancholy? Perchance you are of a phlegmatic temperament, however, and will not become choleric when we announce that this enquiry about your constitution is really for the purpose of introducing our guest organs for this month, the salivary glands.

One of the strangest and most celebrated doctrines of the ancients was that of the *Four Humors*, full development of which led to *Humoral Pathology*, a system of supposed accounting for diseases and of methods for their treatment and cure. The basis for these beliefs was the idea of the *Four Elements* — fire, earth, water, and air — traced back to Empedocles, who lived in the fifth century B.C. This famous Greek scientist held that all matter was composed of various combinations of these "elements." Actually none of them are chemical elements in the modern sense, yet the notion that matter is made of differing quantities of fundamental substances is the cornerstone of the physics and chemistry of today.

The elements of Empedocles worked either with or against each other, expressed as actions governed by love or hate. Compare such modern expressions as "chemical affinity" or "electrical repulsion." Thus, fire and water were opposed to one another, but earth and water were harmonious. The four elements were regulated by the *Four Qualities* — hot, cold, wet, dry — and each element was compounded of a pair of these properties. As shown in the diagram, fire was hot and dry, earth was cold and dry, water was cold and wet, and air was hot and wet. The many kinds of earth, for example, can be accounted for by assuming that one type is a bit colder and dryer than another, or colder but less dry. When the variation in moisture is so far toward the wet side that the substance is more moist than it is dry, then it is no longer earth, but water. Aristotle adopted these views, but stressed the qualities as the predominant forces in the universe, rather than the elements.

In the Hippocratic writings appear the first connections of this system with body fluids termed *humors*. Whether Hippocrates himself, in the fifth century B.C., held these beliefs, is unknown; but either he or his followers and disciples promulgated the associations shown in the diagram. The humors were, citing Greek names first and Latin second, *phlegma* or *pituita* (*phlegm*), *haema* or *sanguis* (blood), *cholen xanthen* or *cholera* (yellow bile), and *cholen melainan* or *melancholia* (black bile). The term *humor* persists today in such a usage as the *aqueous humor* of the eye; phlegm is the mucous secretions of the nose and throat, formerly thought to be a product of the pituitary gland or body, so-called because of this false premise; blood is now known to be a great complex of many substances and not a simple fluid; yellow bile is now termed just bile, and is a digestive secretion produced in the liver

and stored in the gall bladder, *gall* being an old word for bile; black bile has no separate existence at all, but the ancients thought it was a thick, acrid fluid in the spleen or kidneys, probably based on observations of thick, dark blood.

To blend or mix these humors was to *temper* or *complexion* them. If they were all present in the right proportions, the person was healthy, whereas either deficiency or excess of any one or more resulted in disease. Such expressions as "bad temper" or "ruddy complexion" originally had medical implications now largely lost. Each person was supposed to have some dominant humor that governed his temperament; he was either *phlegmatic* (cold, dull, apathetic; now cool, calm, unruffled), *sanguine* (warm, ardent, lively, hopeful), *choleric* (hot-tempered, irascible, passionate), or *melancholic* (ill-natured, sullen; now sad, gloomy, pensive). Note that the phrase "hot-tempered," used in explanation of choleric, is itself a term that comes down to us from the time when humors ruled medical practice. All of these words denoted physical conditions as well as emotional states in the older physiology. Today the medical aspect of them has been dropped, while the psychic remains, sometimes with the same meaning, at other times modified. *Bilious*, for instance, was formerly synonymous with choleric; a bilious old man was an irascible one, a meaning now entirely lost. To "vent one's spleen," or to have a splenetic disposition, are phrases referring back to the spleen as the seat of black bile; and if you think we have outgrown this ancient philosophy, how about the modern American slang expression, "you've got a lot of *gall* to try to get away with that!" And on what day does the Good Humor man pedal his bicycle along your block?

After Hippocrates, the greatest physician of antiquity was Galen, a Greek who lived in Rome in the second century A.D., and who became personal physician to the emperor, Marcus Aurelius. Galen based his theory and practice of medicine on humoral pathology and treated by the principle of opposites. If the patient was hot (with a fever) he was made cold with compresses; if he was cold and wet (perhaps threatened with pneumonia), his excess humor was water and he was kept warm and dry. This sort of treatment could be helpful, as in these two instances, although founded on superficial symptoms alone and with no scientific knowledge of either cause or cure. They could also do much harm, as in excessive blood-letting, strong medicines, and purges. Drawing off blood by using the medicinal leech became such a universal practice that physicians were dubbed "leeches." Galenic principles persisted for nearly fourteen hundred years and accordingly are of great importance in any historical account of medicine.

Turning now to a survey of the tissues and organs of the body that produce one

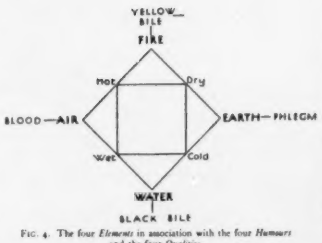

FIG. 4. The four *Elements* in association with the four *Humours* and the four *Qualities*.

From Singer, *A History of Biology*, by permission of Henry Schuman, N. Y.

of these "humors" — phlegm — we begin with the observation that all hollow structures and spaces within the body are covered with a lining tissue termed *epithelium*. One of the predominant functions of this tissue in many situations is secretion, the production of substances, commonly fluid, for certain specific purposes, as digestion or the excretion of wastes. One such function is the passive one of lubrication, quite evident in the digestive and respiratory tracts; just imagine trying to swallow some dry cereal if the passages were likewise dry. Where epithelial linings are composed of squarish or tall cells, or cells in several layers, as in the alimentary canal or windpipe, the lining is kept soft and moist by the secretion of lubricating fluids, and is underlain by a connective tissue framework and often with some smooth muscle fibers as well, and is then called a *mucous membrane*, or *mucosa*. The human lip furnishes a good illustrative example: the outer surface is skin, the inner is a mucous membrane.

Two types of secretion are produced by the mucous membrane of the mouth cavity; *serous*, or thin and watery, and *mucous*, or thick, ropy, and viscous. Starting in lower vertebrates, the manufacture of these fluids is a matter for individual cells, and such *unicellular glands* are widely distributed in the oral lining, whereas in man and other higher vertebrate types, unicellular glands are restricted to a few instances, as the goblet cells of the intestine. Aquatic vertebrates can get along very well with no further elaborations, but when they climbed out of the water and became amphibians, the dry environment favored mutations toward aggregation of the gland cells into masses, the glands thus becoming *multicellular*; still later they were gland complexes, and lastly they so amalgamated as to make a small number of conspicuous organs. These remain purely lubricant in all groups except mammals, but in this highest class have taken on the additional function of initiating carbohydrate digestion by adding enzymes, (ptyalin and maltase), to the liquids they make. Only mammals perform any digestion in the mouth.

All over the mucous membrane of the mouth of man there are scattered an array of glands of various kinds and sizes.

Classed as the *minor salivary glands*, and, named according to location, are the *palatine* (on both hard and soft palate, forming the roof of the mouth), *buccal* (cheeks), *molar* (cheeks close to gum line of molar teeth), *labial* (lips), and *lingual* (tongue). Certain other animals may have salivary glands elsewhere, as the *orbital* (floor of eye socket) of dogs; and whales, having reverted to a completely aquatic existence, have lost those their ancestors had acquired, and now have none at all. The *major salivary glands* are the parotid, submaxillary, and sublingual, all three paired, and all relatively large organs, divided into lobules and supplied with their own vessels and nerves.

On a basis of their secretions, these glands are either serous, mucous, or mixed, manufacturing both kinds. The parotid and von Ebner's glands of the tongue are purely serous, the mucous glands are the palatine and posterior lingual, while the submaxillary, sublingual, anterior lingual, buccal, molar, and labial are mixed. Embryologically, all salivary glands are *ectodermal*, and all have persistent *ducts*, producing external secretions, hence being classed as *exocrine*. This contrasts with such a gland as the thyroid, which is entodermal, loses its duct, and is classified as endocrine, manufacturing an internal secretion that is poured into the blood. Production of secretion in the salivary glands leaves the cells intact (*merocrine glands*), as opposed to cases in which the cells are partially or wholly destroyed.

In shape, the secreting end-pieces are sometimes *alveolar* or *acinar* (rounded), some times *tubular* (elongate), but more often of an intermediate contour designated by combining these words into *tubulo-alveolar*, or *alveolotubular*, or *tubulo-acinar*, as a particular author may prefer. A bunch of grapes provides a mechanical model of a salivary gland, each grape representing an alveolus, each stem a duct.

Some description of the duct system within the three major glands is important in their identification under the microscope. During development, each gland begins as a down-sinking or inpocketing of the epithelial lining, and as growth proceeds this mass of cells retreats farther and farther from its place of origin, retaining a connection by a slender neck or tube which, in the adult, will carry the secretion from the gland to the cavity whence the gland came. The withdrawal of the cell mass is a matter of space requirements in many cases — sufficient room in which to develop. The connection becomes the *excretory duct*, lined with a stratified epithelium. Within a major gland, this duct divides repeatedly, the branches becoming smaller, the lining thinner and pseudostratified, until they penetrate the *lobules* or principal gross divisions of the gland, the final excretory ducts then having a simple columnar epithelium. Next comes the *secretory duct*, so named because thought to assist the alveoli in producing secretion. The cells are simple columnar but have basal striations, thought to be an indication of secretory activity. Further branching in the case of the parotid and submaxillary glands results in very slender *intercalated ducts*, with flattened cells, which connect with the terminal alveoli or tubules, the end-pieces where the bulk of the secretion is made. Extent and occurrence of these various ducts differs in the several glands.

The *parotid* (beside-ear) *gland* is the largest of the three and lies just in front of and below the ear opening, at the rear of the cheek. Its duct is *Steno's* or *Stensen's duct*, which crosses the cheek muscles and opens into the vestibule of the mouth (space between checck and teeth) opposite the second upper molar. This opening may be observed with a hand mirror if a light is directed into the mouth. The parotid secretion in man is purely serous, but is mixed in some other mammals, and contains more enzymes than that of other glands. An acute inflammation of the parotid, due to a virus infection, is *contagious parotitis*, commonly known as mumps. One or both glands may be involved, and the other major salivary glands may be affected.

Under the microscope, a section of the parotid is characterized, by comparison with sections of the other two major glands, as being uniformly dark, all of the alveoli being serous, such cells taking a stain until deeply colored. Ducts are moderately abundant; intercalary ducts are long and so are frequently cut both crosswise and lengthwise and included in the sections.

The *submaxillary* gland is next in size and lies inside of and near the middle of the lower edge of the mandible or lower jawbone. The name refers to the former vogue of calling the upper jaw the superior maxilla and the lower jaw inferior maxilla. Submaxillary could mean beneath either one, hence there is a trend today to substitute the better term, *submandibular*. Histologists and pathologists, if they follow the American habit of shortcutting everything, generally dub the organ "submax." Its duct is *Wharton's duct*, which courses forward to open on either side of the frenulum or partition anchoring the tongue to the floor of the mouth. Upon opening the mouth widely and yawning, elevating the tip of the tongue, and observing the act in a hand mirror, the two openings of Wharton's ducts may be seen side-by-side,, and often may be observed spraying forth a fine stream of droplets, apt to spatter our desk work unless we turn the head aside in yawning.

Histologically, the submandibular presents dark areas with light patches scattered throughout, and with more numerous secretory ducts but fewer intercalated ducts. The dark tracts are serous alveoli and the light ones are mucous alveoli, for this gland is mixed, with serous cells predominating. Some of the mucous tubules and alveoli are capped with a group of serous cells that form a crescentic body termed a *demilune* (half-moon).

The *sublingual* is a mixed, but predominantly mucous gland, and sections appear light in hue, with scattered dark areas and few ducts. Secretory ducts are scarce and intercalated ducts absent, or possibly represented by portions that are so infrequent and so short as seldom to appear in sections. The serous cells occur mainly as demilunes on the mucous alveoli.

The sublingual is not a single gland, but rather a group, with several separate ducts called *ducts of Rivinus*, one for each gland, denoting separate developmental origins. Some of these unite to form a more or less principal *duct of Bartholin*, which joins Wharton's duct; the others open separately nearby along the base of the tongue. These glands are located near the front of the mouth, beneath the mucosa of the floor, and their aggregate size is much smaller than that of the preceding two. Routine sections are fixed in Zenker's or Bouin's, cut 10 micra in paraffin, and stained with Delafield's hematoxylin and eosin. However, other staining combinations make interesting and instructive slides. Iron hematoxylin and Mallory results in gray serous and blue mucous cells; mucin stains may be used; safranin and fast green or eosin and methylene blue are good combinations. A key to typical sections follows:

A) Alveoli entirely serous, ducts moderately abundant, intercalated ducts numerous. . . . parotid.

AA) Alveoli mixed serous and mucous; many mucous alveoli with serous demilunes.

B) Secretory ducts numerous, intercalated ducts few. . . . submandibular.

BB) Secretory ducts few, intercalated ducts absent. . . . sublingual.

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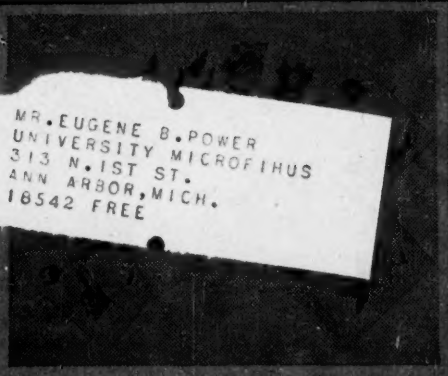

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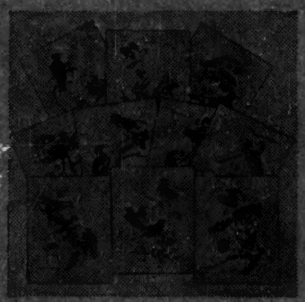

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